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ABSTRACT

The purpose of this handbook is to help vocational education teachers improve the computer skills of their students. The handbook is divided into major sections that describe the concept, provide suggestions for development of the concept, and include a sampling of the variety of application-oriented activities appropriate to vocational education. Topics covered include computer hardware, computer software and software evaluation, computer-assisted instruction, computer-managed instruction, and strategies and methods for introducing computers into the classroom. Eight learning activities and a learning activity evaluation form are provided. The guide also contains a terminology list and lists of resources, such as journals and magazines, general books, resource centers and research projects, general interest sources, and special needs information sources. (KC)

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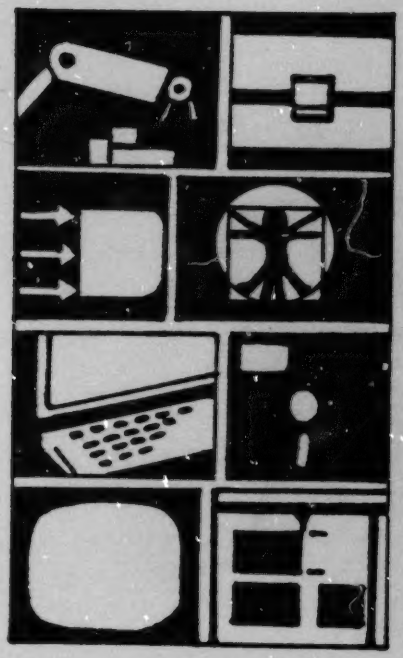
COMPUTER SKILLS IN VOCATIONAL EDUCATION



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Springfield School District

Vocational-Technical Education Department
Oregon State University

Division of Vocational Education
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The most important task for teachers in the Information Age is to build a partnership between traditional and nontraditional education, letting each do what it can do best.

--Dr. Ernest L. Boyer
President of the Carnegie Foundation for the Advancement of Teaching

A METHODOLOGY FOR COMPUTER SKILLS IMPROVEMENT

IN VOCATIONAL SECONDARY PROGRAMS

Developed

by

Vocational-Technical Education Division
School of Education
Oregon State University

and

Springfield School District

in cooperation with the
Oregon Department of Education

1984

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1984

Advisory Committee Participants

This document is the result of the generous and professional efforts of many persons. The contributions of numerous agencies which creatively helped develop the methodology are gratefully acknowledged. Without them, this handbook would not be a reality.

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Computers may yet save our schools, but not without careful planning and effort to overcome the problems that plague computer education.

--Paul Bonner, Senior Editor
Personal Computing,
September 1984

Preface

This handbook was developed to help the vocational teacher help students improve computer skills in vocational classes. Examples in the handbook were derived from a variety of vocational applications of the computer. While there are many specific applications, the procedures explained and the methodology presented will work in any vocational class.

The Vocational-Technical Education Department at Oregon State University and the Springfield School District worked together to develop and test the ideas in this handbook. This effort was made possible through a grant from the Oregon Department of Education, Division of Vocational Education.

Our goal was to develop a process for assessing the computer skills of students, identifying and developing strategies for the teacher to help students correct deficiencies and raise performance levels, and to develop a process for continual assessment of student performance. It is our intention that the ideas in this handbook will provide you with some very practical assistance in working with the computer skills of your students. We wish you success with your students and sincerely hope that you will find this handbook useful.

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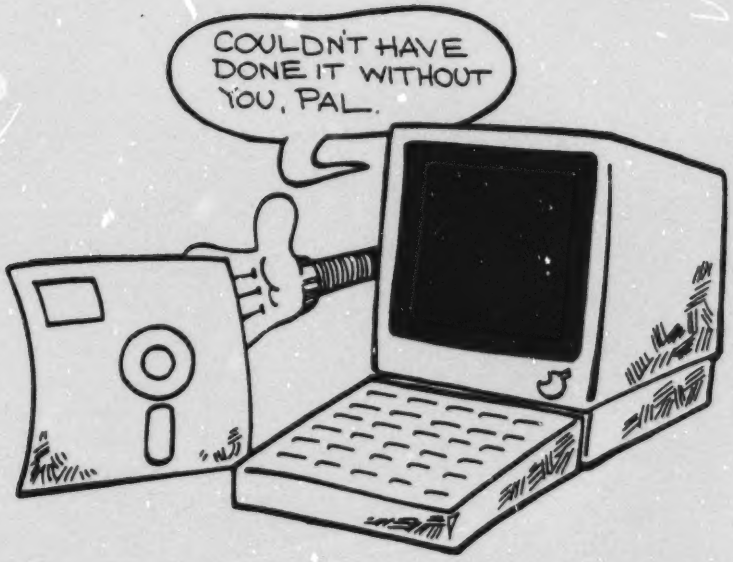
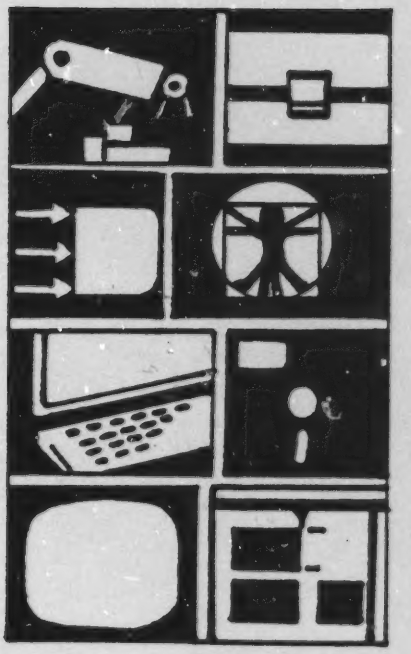




Why Computers in Vocational Education?

Why is it so important to include computers in vocational education? Vocational education introduces students to the world of work and helps to prepare them for their future jobs. In all areas of vocational education: agriculture education, business and distributive education, home economics education and industrial education students depend on programs to prepare them for the jobs of today and tommorrow. By using computers in vocational education programs, applied computer skills are taught, teaching productivity improves, and student learning effectiveness increases.

Orientation

Purpose

The purpose of this handbook is to help vocational teachers improve the computer skills of their students.

Organization

The handbook is divided into major sections which describe the concept, provide suggestions for development of the concept, and include a sampling of the variety of application-oriented activities appropriate to vocational education. The last section contains resources to enrich your efforts to improve the computer skills of vocational students.

Using the Handbook

This handbook is written in a structured text design format with individual sections and blocks. This format allows:

- easy and quick referencing
- room for notes
- ease of updating

Glance through the Table of Contents and block labels. Look for sections of interest to you. As you need different information on computer skills in vocational education, it will be easier for you to find it in this format.

Locate the activities for computer skills improvement which may relate to your teaching situation. Following the process outlined in the methodology segment prepare to implement similar activities in your program. Consult the Terminology and Resource sections to enrich the materials which you are now applying.

Above all, do not be afraid of trying something new, reworking an idea, or modifying a concept/process to fit the teaching situation and your students. Continued utilization of materials will bring continued success.

Teaching with a computer involves providing students with instructional experiences via the computer.

--from How Educators Use Micro-Computers

Principles of Computer Systems: Hardware

Introduction

The dramatic advances in integrated circuit technology and the resulting low cost IC microprocessor and memory chips are impacting every aspect of our technical and personal world through the microcomputer. How do microcomputers work? How do they differ from other instructional machines? All computers, regardless of size or complexity, have four major components:

- Input
- Output
- Processor
- Memory

Sometimes the input and output are grouped together and abbreviated I/O. There is really nothing mysterious or magical about a computer. The easiest way to understand how a computer system works is to relate it to the human system; one that we are all intimately familiar with. The primary function of a computer is to process information. This is something that we, as human systems, do all the time. In some ways a computer system has distinct advantages over us, and in other ways human systems have the advantage. Computer systems can manipulate data of far greater complexity and with greater speed than human systems. On the other hand, our human systems input capabilities (senses) and output capabilites (from muscular movement to singing) are superior in many ways to any planned computer system. Let's take a closer look at the four components of a computer system.

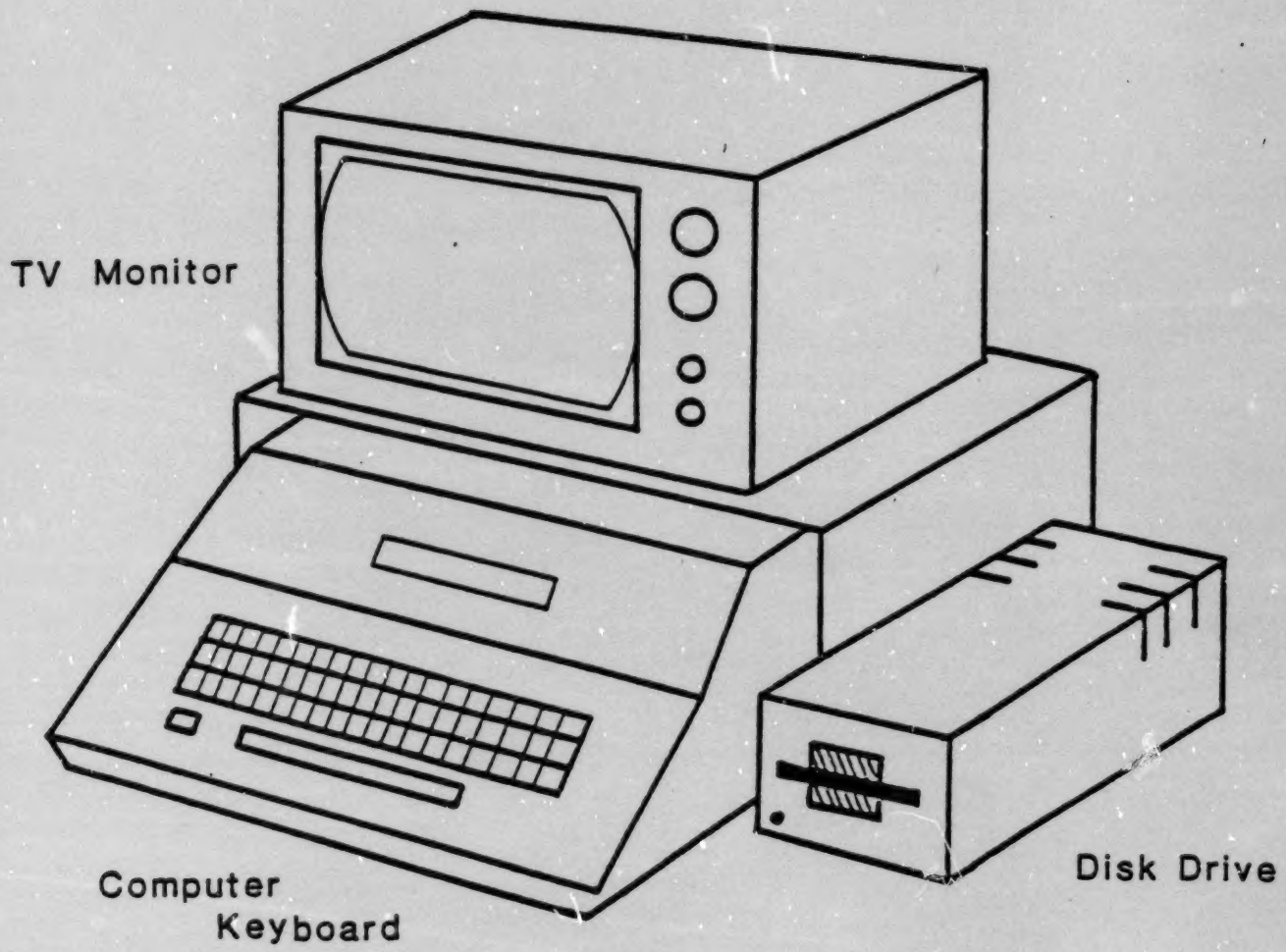
It is only when they go wrong that machines remind you how powerful they are.

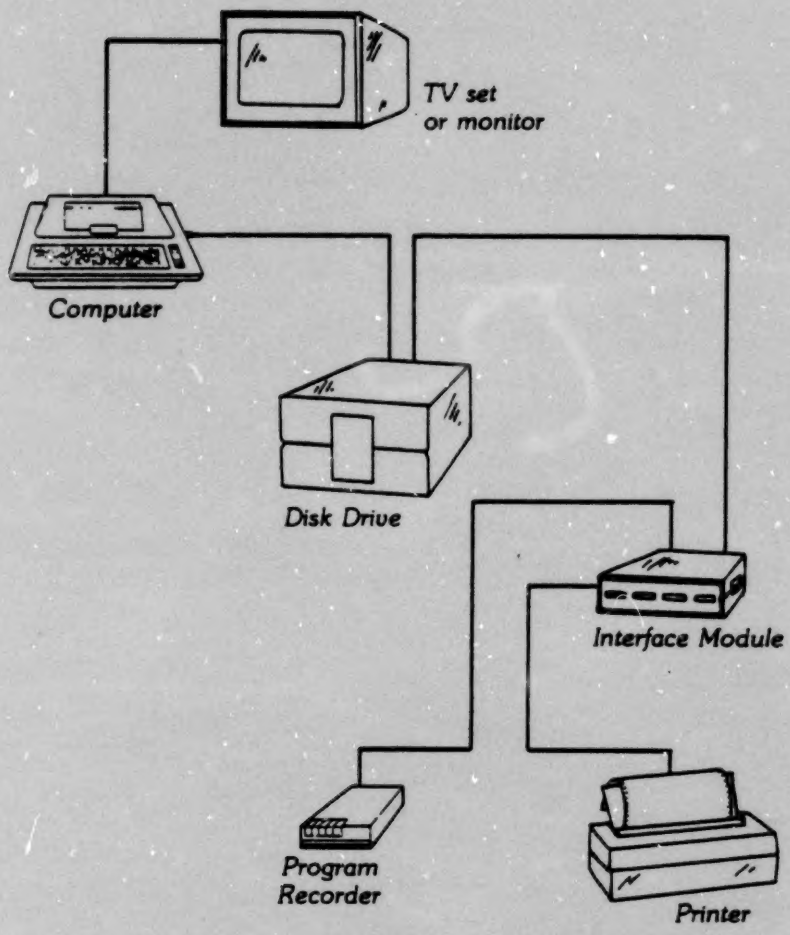
--Clive James

Input

The primary function of a computer system is to manipulate data. Numerical analysis, information retrieval, and robot/machine control are all common examples of how our computer systems are used. Regardless of their specific use, the computer system must have some way of receiving information from the outside world. One of the most common computer input devices is the keyboard. Most microcomputers use a keyboard to receive input information from the user. Computer systems can also receive information from light pens, optical scanning devices, joysticks, analog to digital (A/D) converters and a variety of magnetic mediums. New developments are now taking place to improve the computer's ability to understand speech and "see" images.

Human systems have significantly more sophisticated input capabilities. We have finely tuned senses of smell, sight, hearing, touch, and taste. Recognizing a two measure portion of Vivaldi's "Four Seasons" or recalling the taste of last night's dinner are just two examples of the incredible ways we can receive information from the outside world.


TV Monitor
Computer
Keyboard
Disk Drive


TV set
or monitor
Computer
Disk Drive
Interface Module
Program
Recorder
Printer

Output

Output devices are often grouped together with input devices, since both are often used at the same time by the same user. One of the most common output devices is the video display terminal (VDT). While the video monitor is the most common output device, there are many others. Printers, plotters, and numerically controlled machines are just a few examples. Once again, it is interesting to think about the wide variety of human system outputs. Artistic expression, dance, and athletics are just a few examples. It is important to note that human input and output capabilities dictate the design of computer input/output systems. For example, keyboards and video display terminals should be ergonomically designed for ease of use. The I/O section of a computer make it possible for us to communicate with and use computers.

Processor

The processor is the brain of the computer system. Often abbreviated CPU for central processing unit, the processor orchestrates the flow of data in and out of the computer's memory. It accepts instructions and information several bits at a time in parallel bites. The number of bits it is designed to handle simultaneously determines the processor's strength and word size. We could say the computer takes a "bite" at a time, in fact we call it a "byte". In the early 1970's most processors handled 4-bit words. Most of today's microprocessors, like the one in the Apple II, are 8-bit devices. Not for long though; most newer micocomputers like the IBM are taking advantage of new and faster 16 and 32 bit processors.

Any sufficiently advanced technology is indistinguishable from magic.

--Arthur C. Clark

Memory

Another component of a computer system is memory. Once again we can refer to our own human system. Both human systems and computer systems have working memory and mass memory. The ability to remember telephone numbers, recall conversations, and acquire language is our working memory. In the same way, a computer has user RAM (random access memory), or temporary memory and pre-programmed memory ROM (read only memory). In computer systems the RAM capacity is measured in the number of bytes you can temporarily store. The stored bytes are maintained as long as the computer is turned on. ROM is permanently stored in the memory which contains the machine's instructions for operation. RAM can be thought of as a blackboard that can be used and erased. ROM is more like a typewritten page that cannot be erased and always contains the same information. Mass memory in both human and computer systems is one step away from the brain or processor. Computer mass memory storage usually uses magnetic mediums. Cassette tapes, floppy disks, and hard disks are examples of mass memory storage devices.

Principles of Computer Systems: Software

Introduction

To have a complete and operational computer system you must have both hardware and software. As we discussed in the previous section, hardware is made up of the physical electro-mechanical devices such as the keyboard, processor, or monitor. The software is made up of the programs the computer uses to accomplish specific tasks. These programs are stored on a storage medium, typically a floppy disk or a cassette tape. Without appropriate software you cannot effectively use a computer. Computer programs (software) are designed to accomplish a wide varity of tasks. Word processing, tool speed calculations, electronic circuit analysis, menu planning, and agricultural forecasting are just a few examples of computer programs that have application in vocational education programs. Computer software is so important that whenever possible you should try to determine your software needs before you purchase your computer hardware.

For students to use any already programmed material requires very little "Computer Literacy." About the only skills one needs are those required to operate a typewriter: the ability to locate keys on a keyboard and to turn a switch on. In fact, one error schools frequently make is to attempt to teach everyone how to program the computer.

--Julie McGee

Compatibility

When you determine your immediate software needs and your existing or planned hardware, you have to consider the issue of compatibility between software and hardware. The software you want to use must be compatible with your hardware or you won't be able to use it. Every new technology evolves with a variety of standards before a single or dominant standard emerges. In the record industry we had 78 RPM and then 33 1/3 RPM. With video recorders we still use both VHS and Beta. But, each system must be internally consistent to operate. You can't use HO trains on an N gauge track without significant modifications.

Computer programs are written to be compatible with computer operating systems. A computer program designed to operate on one computer operating system will not necessarily operate on another system. The major operating systems today are Applesoft and Apple Pro Dos, compatible with the Apple II series; PC DOS and MS DOS, compatible with the IBM and IBM compatible hardware; and CPM, compatible with a wide variety of Z80 based hardware such as Radio Shack and Kaypro. When selecting your hardware and software be sure to maintain compatibility and flexibility. The following are some of the questions you should ask yourself as you develop your plan for using computers in your vocational education program. Which operating system is most commonly used in your school? Which operating system has the largest software base in vocational education that you can use? Which operating system is most likely to have an expanding and growing base of software in vocational education?

Commercial

There are two general types of software available: commercial software and public domain software. Commercial software is developed by a commercial enterprise and marketed for a profit. It is copywritten and often copy-protected. The cost of the software can vary widely. Educational software on a floppy disk may cost anywhere from twenty-five to several hundred dollars. One of the dilemmas created by the widespread use of computers is the discrepancy between the cost of the medium (floppy disk) and the cost of the the message (program). A floppy disk only costs a few dollars while the program stored on it may cost several hundred. Because of this discrepancy and the ease of copying computer programs, most commercial software is copy-protected to prevent widespread copying or pirating of software.

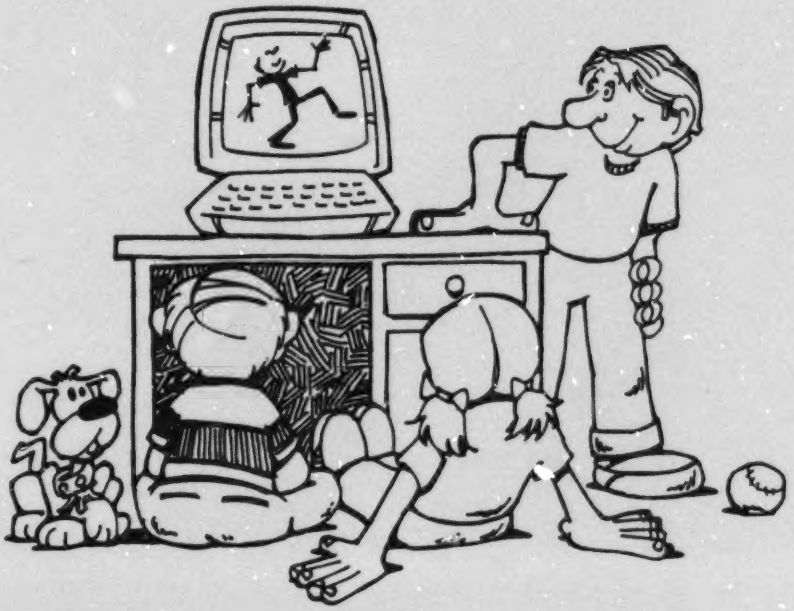
Right now there is a shortage of good commercial software that can be used in vocational education programs. Commercial software producers develop software for the most lucrative markets or the "center of the target." Vocational education is not the center of the target for software producers. Even within the educational market, vocational education is not the center of the target. But gradually as more companies become involved in software production, more programs are being developed with application in vocational education. In later sections you will find lists of sources for commercial software and strategies for evaluating software.

Don't expect to learn computers by playing computer games. Most computer games contribute to computer literacy about as much as playing billiards contributes to learning Newtonian physics.

--John Bear

Public Domain

Public domain software is software that has been contributed to the public domain and may be copied and exchanged with modest or no cost. Just as printed curriculum materials developed by your state department are public domain and can be copied and used for educational purposes, public domain programs are usually not copy-protected and may be copied. When you use public domain software you should be sure to give credit to the author and/or sponsoring agency. Public domain programs are typically not as sophisticated or as powerful as commercial programs but are often valuable to meet a specific need. In the resource section there is a list of sources of public domain software with applicaton in vocational education. With the expense and difficulties in finding good commercial software, many vocational teachers start out using public domain software.



Develop or Modify

Because of the difficulty in finding the right commercial or public domain software, many vocational teachers have developed their own software. Writing your own software may be a difficult and frustrating process. It requires a proficiency in computer programming in addition to the skills needed to develop instructional material. Vocational teachers have extremely demanding jobs. It is unreasonable to expect vocational teachers to become expert at computer programming in addition to all the other areas for which they are responsible. It is more important for vocational teachers to become good computer users, so they may be more productive and effective. Many computer programs are developed by a team of computer programmers and instructional designers.

Some vocational teachers that have skills in computer programming will find it easier to modify existing public domain software than developing an entire new program. In this way programs can be personalized to include information directly related to your teaching program. Examples of how you may modify computer programs include adding the name of your school, your name, or tying it directly to your other curriculum materials. This can easily be done with public domain programs, but not as easily as with copy-protected commercial software.

Most computer users will never be programmers. Some will learn to modify other people's programs. A small percentage will become programmers.

--John Bear, PhD
Author, The Computer Wimp

Evaluating Software

As more and more vocational teachers incorporate the use of computers into the curriculum, there will be an increasing need for the identification and evaluation of computer software with applications in vocational education. For the most part hardware is not the problem. More and more schools are getting computers and more teachers and students have access to them. Identifying good software is a far greater problem. You can get evaluative information on computer software from a variety of sources:

- Magazine reviews
- Other teachers
- Regional or state clearinghouses

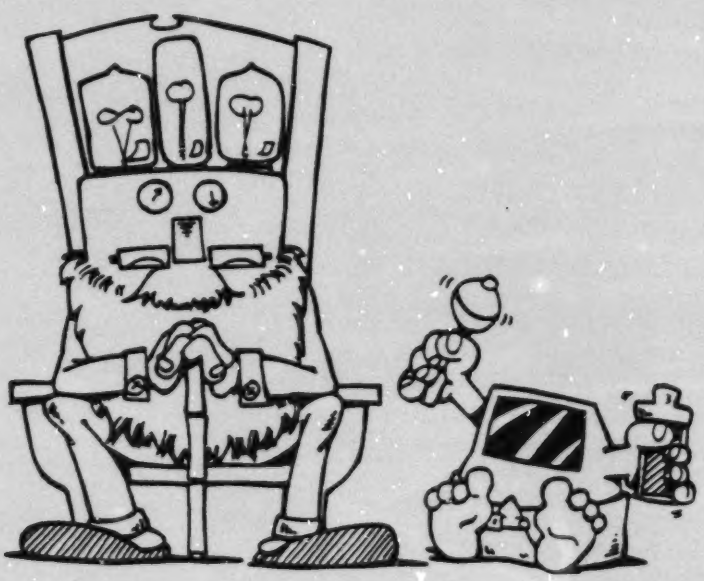
One of the best ways to learn about new programs is to read magazine reviews in your subject area. In the resource section there is a list of magazines for each vocational area. Professional magazines and journals will put you on the information mainstream and will help keep you up-to-date. Talk to other teachers that use computers in their classes. Share your experiences and evaluations with other teachers. Check with the Oregon State Department of Education for assistance. They can access information from around the country.

Technology has the potential to free teachers from the rigidity of the syllabus and tap the imagination of both teacher and student to an extent that has never been possible before.

--Dr. Ernest L. Boyer
President of the Carnegie Foundation for the Advancement of Teaching

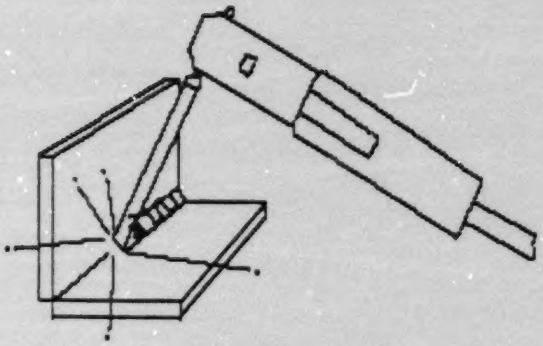
Instruments

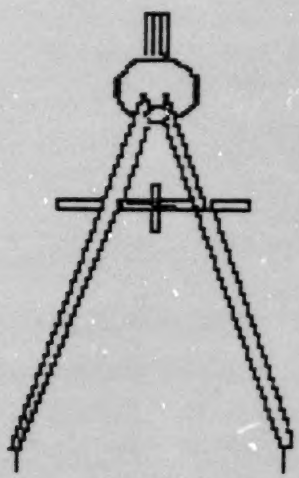
There are many different evaluation instruments that are used to evaluate computer software. Some are used with all types of software and others are designed specifically for software with application in vocational education. One example of an evaluation instrument designed specifically for vocational education software is the following form developed by the Department of Vocational Education, Oregon State University with a grant from the Oregon Department of Education. This evaluation instrument is easy to use, requires no special instruction, and can be easily shared with other teachers. You may make copies of the instrument in this book and use it to review programs you use.

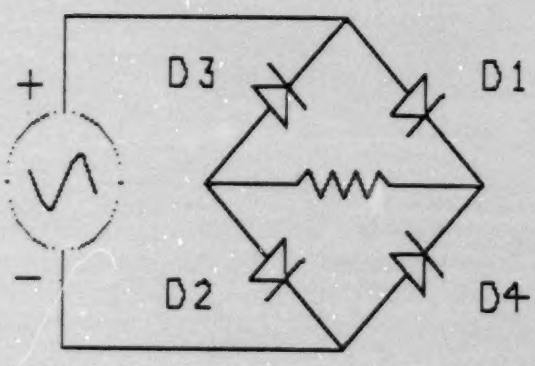


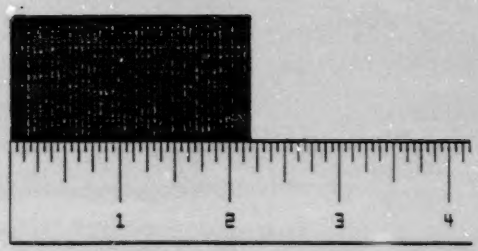
Teachers want materials that will give students expanded practice for skill mastery and they want software that can give them more time to meet their students' instructional needs--literally to "free-up" time for teaching.

--U.S. Department of Education Study









Vocational Education Software Evaluation (User's Guide)

PURPOSE

This software evaluation instrument was designed to help vocational teachers identify and select quality computer programs with application in vocational education. You can make a contribution to your profession by using this instrument to evaluate a computer program you are currently using. While most of the items in the instrument are self-explanatory the following instructions will help you complete the instrument.

DESCRIPTIVE

Vocational Subject Area:

Fill in the vocational subject area or areas where this computer program has application. If possible choose from the following list.

Agricultural Educ.
- Ag. Economics
- Ag. Mechanics
- Animal Science
- Leadership
- Plant Science
- Soil Science

Health Services

Industrial Educ.
- Electronics
- Graphics/Drafting
- Metals
- Power Mechanics
- Woods/Construction

Business Educ.
- Bookkeeping/Accounting
- Clerical/Secretarial
- Keyboarding
- Marketing/Distributive Educ.

Forestry

Home Economics Educ.
- Child Care Services
- Clothing
- Food Service
- Individual and Family Resource Management
- Institution Management
- Nutrition and Foods

Service Occupations

Grade Levels:

Bracket the grade level zone that shows all of the grades this program could be used in. For example a computerized drafting program might be used in grades 9-C.C. (Community College) shown as follows:

K 1 2 3 4 5 6 7 8 [9 10 11 12 C.C.]

REQUIRED HARDWARE

Operating System:

Unfortunately not all software is compatible with all computer hardware, therefore it is especially important that you indicate what system a computer program will operate on. In this space fill in the machine the program is intended to operate on. For example: Apple IIe; IBM Personal Computer; or Radio Shack TRS III.

Required Peripherals:

Check only those peripherals required to operate the computer program you are evaluating.

CONTENT & USABILITY

For each of the items in the Content and Usability sections circle the number that represents the level to which each item is satisfied.

Only use NA (not applicable) when an item is wholly inappropriate for the program you are evaluating.

Please use the comments section to indicate major strengths and weaknesses.

This document was developed pursuant to a grant from the Oregon Department of Education. However, the opinions expressed herein do not necessarily reflect the position or policies of the Oregon Department of Education, and no official endorsement should be inferred.

1983

Vocational Education Software Evaluation

DESCRIPTIVE

Program Name/Files: _____

Author/Vendor: _____

_____

_____

Cost: _____ ☐Copywritten ☐Public Domain

Type of Program: ☐CAI ☐Utility

Vendor Support: ☐Yes ☐No Updates: ☐Yes ☐No

Date of Review: _____ Reviewer: _____

Vocational Subject Area(s): _____

Grade Levels: Bracket zone

K 1 2 3 4 5 6 7 8 9 10 11 12 C.C.

Estimated Execution Time: _____ Minutes

REQUIRED HARDWARE

Operating System: _____ No. of Disk Drives: _____

Required Memory: _____

Required Peripherals: ☐Printer ☐Color Monitor

☐Plotter ☐Paddle/ Joystick ☐Modem

☐Voice Synthesizer

CONTENT

	Low				High	
NA	1	2	3	4	5	Content Accuracy
NA	1	2	3	4	5	Compatibility with Course Content/Strategies
NA	1	2	3	4	5	Presentation of Technical Information
NA	1	2	3	4	5	Presentation of Career Information
NA	1	2	3	4	5	Free of Stereotyping

Comments:

USABILITY

	Low				High	
NA	1	2	3	4	5	Quality of Written Documentation
NA	1	2	3	4	5	Quality of Directions within Program
NA	1	2	3	4	5	Quality of Screen Format
NA	1	2	3	4	5	Level of Student Interaction
NA	1	2	3	4	5	Amount of Keyboarding Required

Comments:

Computer Applications in Vocational Education

Introduction

The computer can be viewed as a tool for enhancing the delivery of instruction (through computer assisted instruction) and aiding classroom or instructional management (through utility programs). The potential applications of computers in vocational education settings go far beyond the provision of direct instruction. The classroom utilization of the computer raises student motivation. Color, music, and animated graphics add realism and appeal to instructional exercises, laboratory activities, and simulations. Personalized responses to student-computer interactions yield a high rate of reinforcement. The computer's memory capacity allows for the monitoring of student performance and record keeping. The ease with which the computer can be programmed and available software provide a positive learning environment, especially for special students. The teacher's content control is enlarged as more information is put easily at the teacher's disposal. Above all, the vocational student is exposed to computer applications comparable to the current and future work environment.

Computer Assisted Instruction

The emergence of computer technology coincides with the heightened awareness among vocational educators to increase the quality of technical instruction. Computer-Assisted Instruction (CAI) delivers instruction directly to students by allowing them to interact with lessons programmed into the system. The various applications can best be presented in terms of the instructional modes that the computer can facilitate most effectively:

- Tutorials
- Drill and Practice
- Discovery
- Simulations
- Instructional Games

For the vocational student, CAI provides an important linkage between traditional classroom instruction and experiences with private or public sector practices. The instructional process for these students is often individualized through CAI. The variety of available formats and software flexibility also provide opportunities for group instruction/interaction.

Tutorials

The tutorial mode of instruction is used primarily to provide concepts to students. Information is presented in small units followed by a question. A tutorial program follows a format of branched instruction which allows the student to indicate responses to the questions and provides appropriate feedback. The more alternatives available to the computer, the more adaptable the tutorial can be to individual differences. A tutorial may contain words alone or be combined with computer graphics to illustrate the concept(s) being conveyed. Tutorials often provide the student with explanations of their wrong answers and include immediate remedial instruction.

Drill & Practice

Drill and practice is an instructional mode which assumes that a concept, rule, or procedure has already been taught to the student. This method coincides with the computer's ability to continuosly and patiently provide feedback and reinforcement of the skills being taught/reviewed. The program leads the learner through a series of examples to increase dexterity and fluency in using that particular skill. This mode of instruction is often used with basic skill areas. Drill and practice programs are available for most vocational skill areas where several practice problems may be required to reinforce a particular skill. Such would be the case with vocabulary building or mathematics problems.

It (the computer) can stimulate students to think, to make decisions and to explore a world beyond the classroom.

--Julie McGee

Discovery

Discovery is a general term to describe instruction which involves problem-solving activities or an inductive approach to learning. The student must actively solve the problems created or presented by the computer. Discovery programs require the student to investigate, plan and organize, develop strategies, and make calculations. It approximates laboratory learning and parallels real-life situations. An aim of the discovery approach is the greater level of understanding attainable through creative problem-solving.

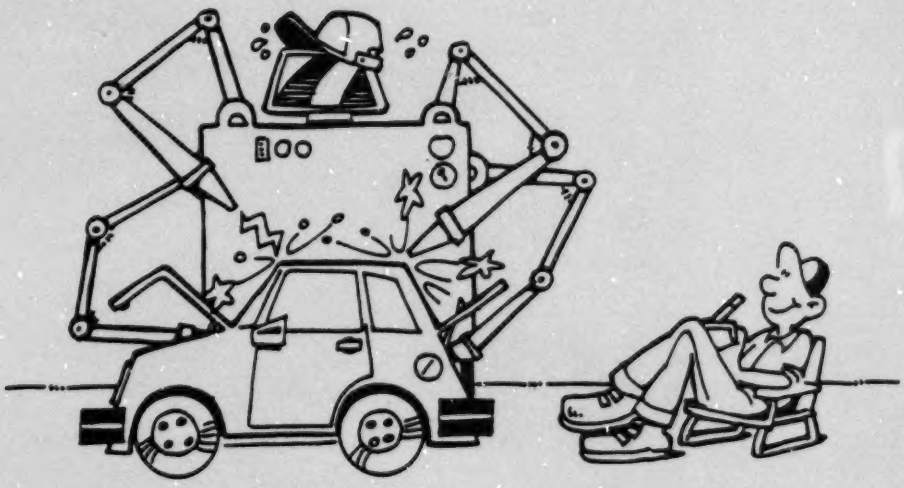
Simulations

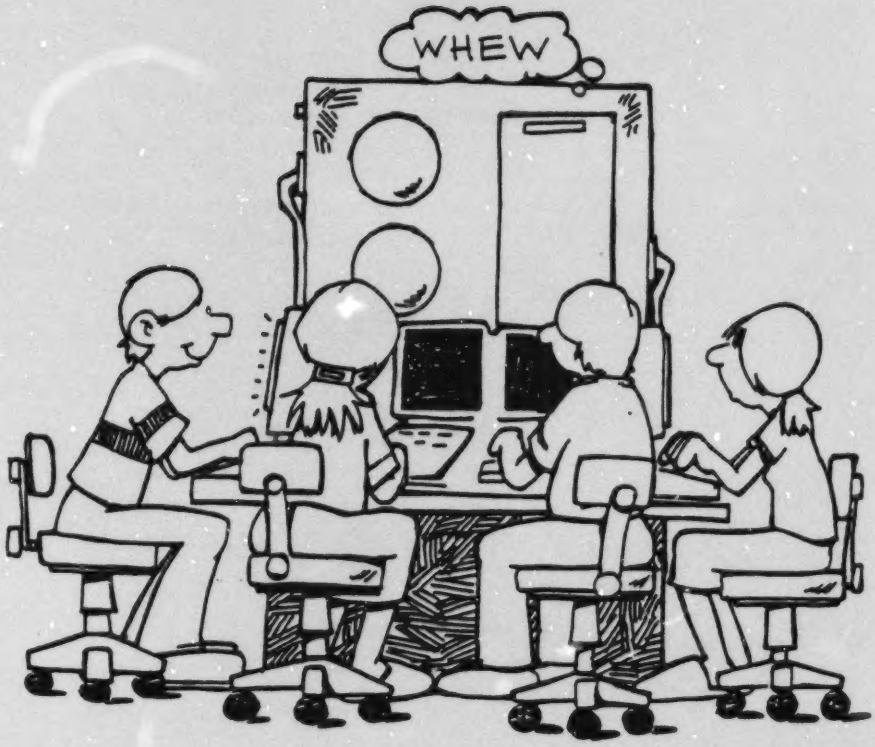
Simulations, using the computer, provide instructional experiences for the student that might not otherwise be available in the classroom. In this mode, the learner confronts a scaled-down approximation of a real-life situation. This could be a concept, process, equipment or machine operation, training station, and even role playing. It allows realistic practice without the expense or risks otherwise involved. A variety of situations can be explored, variables changed, and procedures repeated. In everyday training the airline companies use sophisticated computer simulations for flight crew training. Business management problems are also popular computer simulations.

The most powerful benefits of computers in learning are realized when students use technology to achieve high-order learning, when a student can, in a very real sense, "converse" with the computer and develop better thinking in the process.

--Dr. Ernest L. Boyer
President of the Carnegie Foundation for the Advancement of Teaching

Instructional Games Instructional games are activities which may or may not include simulation elements. They employ a set of rules and usually have a winning strategy. For a game to be instructional, the skill practiced should relate to a specific educational goal or objective. Basic knowledge of concepts or skills in the vocational area are typically included and problem-solving skills are utilized to win. When applied to instructional tasks, games can be a highly motivating framework.




WHEW

Computer Managed Instruction

The computer can be utilized for several management situations in the instructional process. The administrative tasks within the classroom setting such as recordkeeping, testing, inventories, attendance, and grade reports are easily coordinated with the computer. The aim of computer-managed instruction is to reduce the time spent in repetitive and tedious chores, thus reducing the administrative burden in the classroom setting. Extensive commercial and teacher written software is available for the vocational setting. Through such programs the teacher is able to:

- Administer and score tests
- Diagnose and prescribe remediation
- Manage grades and laboratory activities
- Inventory and control of equipment and supplies
- Utilize word processing capabilities
- Manage spreadsheets

In these instances, the computer is not involved in the actual teaching of material. Instead it is used as a tool to perform the tasks which traditionally involved grade books, ledgers, and file cabinets full of paperwork. Management applications of the computer have had great appeal among teachers of all subjects.

Word processing is one of the things computers do best. Once many people get started, they rarely return to pencils, pens, or typewriters again.

--John Bear, PhD
Author, The Computer Wimp

Administer & Score Tests

The administering and scoring of tests is easily accomplished through programs designed to aid the teacher in developing test question files, answer keys, and evaluation procedures. Teachers are able to quickly aquire the necessary skills to construct such tests. Students are able to take the test using the computer and receive immediate performance feedback. Diagnostic information is readily available for the teacher. This process is particularly helpful to the teacher when students are absent during testing times.

Manage Grades & Laboratory Activities

The computer can store and manage the grades and progress of students. Test scores, laboratory evaluations, occupational skills, performance levels, and other measures are easily handled through the computer. Grade book programs in a variety of styles and formats are commercially available. Many teachers have used data base management programs to develop their own record keeping system. In addition to grading and evaluation, the computer can be used to manage laboratory activities, classroom tasks, clean-up or seating charts. They are able to maintain a bulletin board of information. Daily lesson plans, course and daily objectives, learning activity packages, handouts, and worksheets can be maintained and delivered through the computer. Keeping information and content current is much easier and less time consuming.

Teachers probably will increasingly become schedule coordinators, overseers of decorum, and counselors.

-- R. Stake

Inventory & Control of Equipment & Supplies

Supply, material, chemical, equipment, and machinery inventories are easily kept by utilizing any number of programs designed for this purpose. Shelf life, spoilage, reorder information, specifications and similar data are easily entered and readily available. Preventative maintenance and servicing records are no longer a major investment of time. Through the computer all these functions can be accomplished.

Word Processing

Word processing programs can aid the teacher in writing, editing, and saving text information. This includes letters, laboratory activities, handouts, and other written materials. Using word processing capabilities of the computer replaces extensive typewriting. Sentences, words, and paragraphs can be added or changed and spelling errors can easily be corrected. Mailing labels can be generated or multiple copies of correspondence can be personalized. These capabilities provide the teacher with a powerful system for documentation and written communications.

Manage Spreadsheets

Computer programs are also designed for spreadsheet manipulation or the management of multiple pieces of information (data). Data base programs facilitate the recordkeeping operations which are constant to any teaching situation. A variety of formats and form designs are available for information handling and storage. Retrieval and updating become easy tasks with such programs.

Methodology: Strategies

Introduction

After you've decided to use computers in your vocational classes, how should you start? One of the most important steps is simply to start. Do not wait for someone else to do it for you. The sooner you start, the sooner you and your students can benefit from the use of computers. Four important steps to follow are:

1. Use your advisory committee.
2. Work with local business and industry.
3. Coordinate with your school and district.
4. Integrate computer use into your curriculum.

Advisory Committee

One of the strengths of a good vocational program is the advisory committee. A good advisory committee can help keep programs up-to-date, place students, and select equipment. Your advisory committee should be involved in developing a plan for using computers in your classes. They can help you develop educational objectives for computer use. The following are a few of the questions your advisory committee can help you explore. How are computers used in specific job areas? How does your advisory committee anticipate that computer skills will change in the future? What types of computer hardware do they use in their business? What types of computer software do your advisory committee members use? While not all of your advisory committee may be using computers, many of them are, and more of them will do so in the future.

Business & Industry

Increase and use your ties with business and industry. Take your vocational class on field trips to see computer applications in your vocational area. Manufacturing plants, restaurants, farms... almost any type of business and industry is using computers to increase productivity. Rather than tell your students about it, show them. Invite local business and industry representatives to come and speak to students about computer uses and skills needed in their company. Some companies will consider donating computer equipment to your program. Look for help outside of your school.

Coordinate with your School

As you plan to incorporate the use of computers in your vocational area be sure to coordinate your plans with your school and district plans. One of the first considerations is whether or not computer equipment and activity should be centralized in one school computer lab or decentralized in teaching classrooms. In the case of vocational education it is important to have computers right in the teaching laboratory. Vocational students need direct access to computers to learn applied computer skills, increase productivity and learning effectiveness. In some cases it may require using computer equipment other than the type used in the rest of the school. Whenever possible try to maintain computer hardware and software compatibility with the rest of your school. Take the time to learn how other teachers in your school are using computers in their classes and be sure to share your planning with others. Vocational education can and should take the lead in incorporating computers into your classes. After all, vocational education is where students meet the world of work.

Teacher Productivity

Vocational teachers can use computers to increase their teaching productivity. More than most teachers, vocational teachers have great demands on their time and energy. Maintaining teaching labs, developing new curriculum and staying up-to-date with changing technology are just a few of the day-to-day responsibilities of vocational teachers. Computers can help vocational teachers meet these responsibilities and others. Utility programs for word processing, database management and spreadsheet calculations can dramatically improve vocational teachers productivity. Using word processing alone can significantly reduce the time required to generate and edit tests or handouts. Database programs can be used to manage and record your inventory or resource file. Spreadsheet programs can be used to track your budget. Specialized utility programs designed to maintain grades can help to better evaluate and track students' work. Using computers to increase productivity can help vocational teachers work closer with students and update curriculum.

Learning Effectiveness

Computers can help increase learning effectiveness in vocational education. Computer assisted instruction can provide students with individualized instruction, provide remedial and enrichment instruction, provide audio and video support, and give students access to massive information retrieval bases. Computers can help students reach beyond their present constraints and limits. A computer program that simulates an oscilloscope AC wave pattern and helps students learn how to interpret readings, or a program that helps students learn to type are excellent teaching tools. When used correctly computers can complement and supplement your existing instructional strategies.

Methodology: Goals & Objectives

Introduction

To be able to use computers effectively in their classes, vocational teachers need a plan of attack, a methodology they can follow. Just as in any other aspect of curriculum development, you should start with your course goals and objectives. Three major goals in vocational education for the use of computers are:

- Provide students with applied computer skills in their vocational area.
- Improve your productivity and effectiveness in teaching.
- Use computer assisted instruction (CAI) with your students as instructional strategy..

Vocational Skills

Vocational students are preparing for the world of work. Computers are becoming a more and more important part of everyone's work. Whether your students go on to become auto mechanics, dietitians, accountants, or farmers, it is likely they will have to use computers on the job. Vocational education programs can realistically prepare students for the jobs of tomorrow in today's classes. In the world of work, computers are used to solve problems, manipulate and store information. Your students' ability to use computers on the job will be enhanced by using them in today's classes. It is not necessary to have a computer for every student and the students do not have to use them all the time to gain vocational skills in using computers. To help your students gain vocational skills using computers, think of the computer as any other piece of equipment used in your teaching. In vocational classes students can learn how to get the job done. From word processing and inventory control to computer aided manufacturing vocational students need to develop skills in using computers in vocational areas.

Integrate into Curriculum

Be careful not to develop the use of computers in your program as an add on. The use of computers should be carefully tied to the rest of your curriculum and instructional strategies. Develop a set of learning objectives related to the use of computers. For example, you may want students to be able to use the computer to generate a single page report, analyze a budget, locate an auto part, or create a drawing. Carefully identify your learning objectives and then design activities that will maximize the use of your facilities while serving all your students. Your computer activities may be short and tied to other activities or equipment. Do not duplicate activities on the computer that can be as effectively done with paper and pencil. As you develop objectives for computer use, make sure you plan to evaluate them. Keep your activities challenging but not frustrating and provide your students feedback on their performance. Remember curriculum planning is an on-going process: one that should be consistently revised and modified to meet your students' needs.

What teachers must decide is how this new technology can be used most effectively...As teachers, our challenge is to integrate the micro-computer into a curriculum that meets its objective while retaining its humanity.

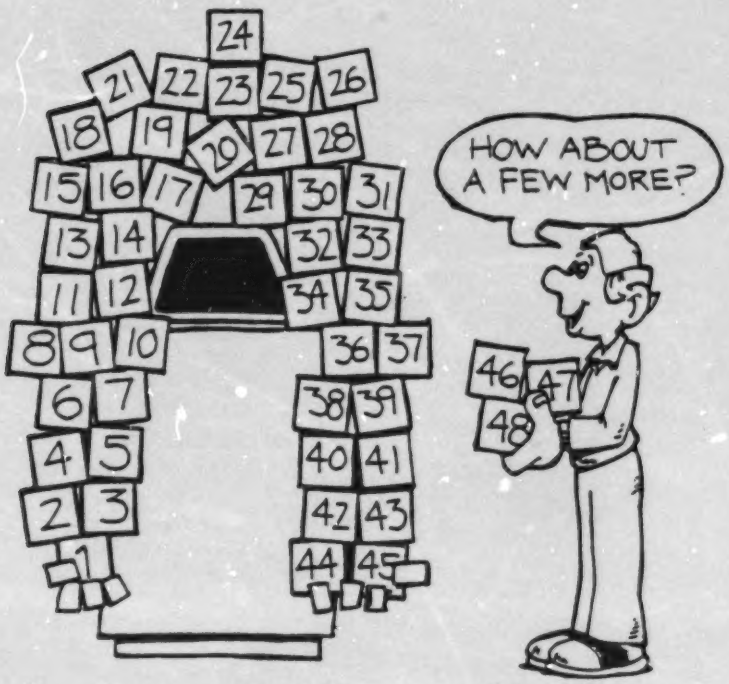
--Julie McGee

Activities

Introduction

Students activities using the computer should be blended into the regular schedule of activities. Do not have a separate section or week devoted to the use of the computer. As the students work in your class, they should come to think of the computer as an important tool or piece of equipment they can use. Since your computer equipment will be limited and it is unlikely you will have a computer for every student, you should:

- Have the students work in teams of two or three.
- Keep the activities short and meaningful.
- Have students do prep work before going to the computer.



Care of Equipment

We tend to think of computer equipment as being extremely sensitive, requiring careful care and attention. In fact, for the most part computers are quite rugged and even student-proof...well almost. You can use a computer in a lab environment such as in construction, metals, or agriculture. In an extremely dusty or dirty environment you should use a plastic housing to protect the computer, but be sure to allow room for proper air ventilation. Some other points to note:

- Emphasize proper care of the disks.
- Emphasize the importance of reading and following instructions carefully.
- Have the students check with you about anything unusual.

Once students are regularly working with a computer system, they will have access to information sources far more extensive than the traditional textbooks...Teachers, too, will have access to a wide range of information sources and may use computer networks to exchange ideas with other teachers, consultants and state education agencies' curriculum specialists.

--Mima Spencer and Linda Baskin

Activities: Examples

Introduction

This section contains the actual activities that were used in the field test at Springfield High School in the spring of 1984. These are not intended for student use in your vocational programs exactly as presented in this handbook. They are included to show a format and approach to computer activities for vocational classes. Regardless of your vocational area, the format and approach presented here will apply to your area. If you have a commercial or public domain program that you can use in your vocational area, you can use the format of these activities. Note that many of these activities require the use of a computer disk created solely for the field test. Also, note that some of the early activities are designed to help students learn some of the basics of computers, before getting into specific vocational applications.

Check Student Prior Knowledge

When you start a new year or term it is a good idea to check your students prior computer knowledge. Estimates vary on the number of students that have computers at home. Your students may differ from the average, but the fact is that more and more students have computers at home and are using them. Here are a few questions we asked in our field test and you may want to use.

1) List all classes in which you have used computers.

2) Do you have a computer at home? If so, what kind and for what do you use it?

3) Do your parents use computers at work? If so, for what do they use them?

4) What do you think are the three best uses of a computer?

Field Test Sample

You may be surprised at the results. In our field test we found that only 43 percent of the vocational foodservice students had used computers in other classes, even though the school has a large computer lab and uses them in math and science classes. Among our field test sample eight percent of the students had computers at home, and 25 percent indicated their parents used computers at work. Ask your students about their prior computer knowledge and activity. The answers you get will help you plan to use computers in your classes.

The mere fact of using a computer doesn't make school lessons or business programs better, just different.

--John Bear

Computer Skills Improvement in
Vocational Secondary Programs

Name:_____

Activity # 1

Title: Computer Use
Survey

1) List any classes in which you have used computers.

2) Do you have a computer at home? If so, what kind and for what do you use it?

3) Do your parents use computers at work? If so, for what do they use them?

4) What do you think are the three best uses of a computer?

Computer Skills Improvement in
Vocational Secondary Programs

Name: _____ Activity # 2

Title: How does a computer work?

Introduction: Computers are being used more and more. They are being used at home, at work, and for fun. How do they work and what do they do? To help you to be able to use computers more effectively you should understand the basics of a computer system. This activity will help you explore how a computer works.

Activity:

We can think of a computer as consisting of five main units which work together as a system. First the system must have a way of getting the data into the computer. This unit is called an input device. The information or data the computer processes is stored in memory until we are ready to use it. When the computer processes the data it is done in the arithmetic or logical section. A computer has to make the results availabe to us. This is done through the output device. The control section directs all operations of the computer system.

INPUT DEVICE

The primary function of a computer system is to manipulate data. Numerical analysis, information retrieval and word processing are all common examples of how computer systems are used. Regardless of their specific uses all computer systems must have some way of receiving information from the outside world. The most common computer input device is the typewriter-like keyboard. Though the keyboard is the most common input device, it is only one of the many available in computer systems. Computer systems can also receive information from light pens, optical scanning devices, joysticks, or voice.

NOTE: This activity was designed for the field test in the foodservices area. You may use this format for computer activities in your area.

Some of the most commonly used input devices are:

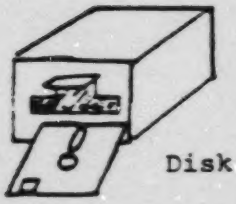
Card reader

Magnetic tape

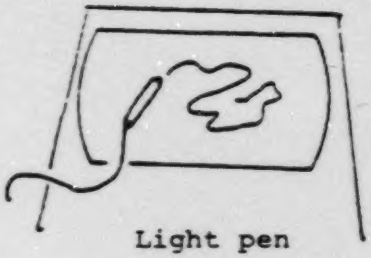
Magnetic disk

Printing terminal

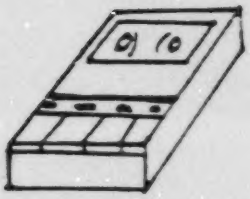
Keyboard



Disk drive and disk



Light pen

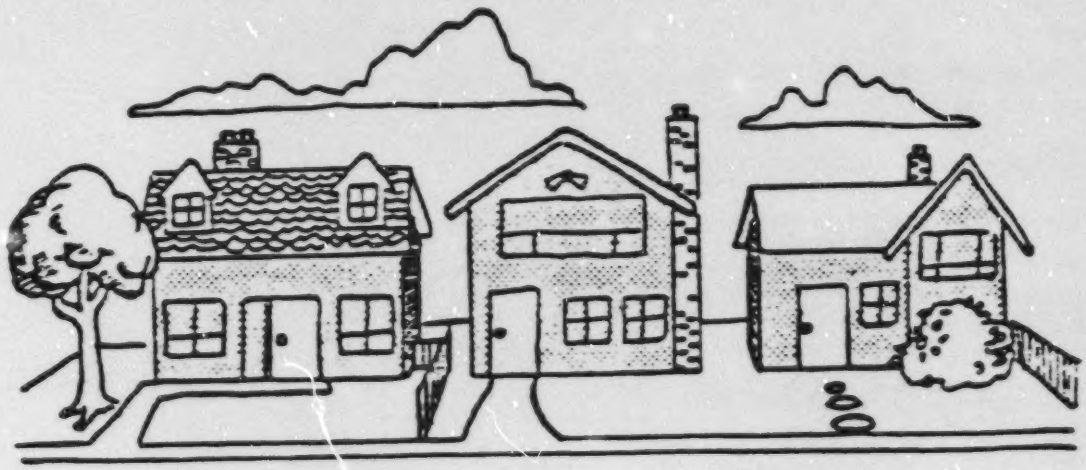


Cassette tape

MEMORY UNIT

The memory unit is the part of the computer system where the data is stored. The memory receives its data from the input device. The data is stored until it is needed by the other parts of the computer.

The storage or memory section can be visualized as a large cabinet with a lot of tiny compartments. Each box contains data. All data is stored in memory before it is processed by the computer. The computer remembers the data received from the input device, and the results from the processing of the data. The size or capacity of the storage unit determines the amount of information that can be held within the computer at any one moment. The stored data can be found quickly by the computer because each location, position, or compartment is numbered, just like the homes on your street. Instructions and data are identified by an individually numbered location called an address.

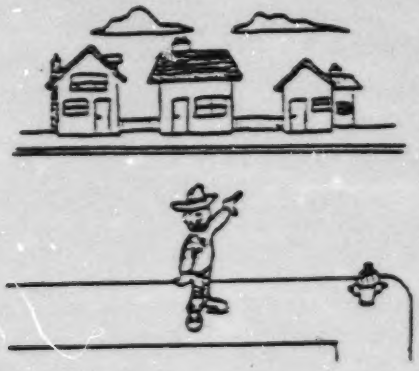


ARITHMETIC AND LOGIC UNIT

The arithmetic and logic units perform all the computer's processing operations. The operations of addition, subtraction, multiplication, division, and comparison are carried out in this unit. Complex calculations are combinations of the basic operations and follow a sequence of instructions. The number of instructions required for the solution of a problem varies depending on the problem.

It is the job of the arithmetic and logic unit to give the computer instructions on what to do with its stored facts to solve a problem. The unit receives its input from the storage unit and, after carrying out the appropriate calculations, sends the answer back to the storage unit, ready for use when it is needed.

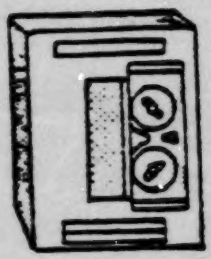
Comparing, sorting, and rearranging information are the kinds of logical operations done by computers. Just as you can sort a deck of playing cards into clubs, diamonds, spades, and hearts or sort tests according to the score, the computer can arrange any set of facts it is instructed to follow.
To help you understand the process, imagine you are visiting a friend who has just moved into a new neighborhood, and you've forgotten the address but not the street. There are three similar houses on the street. You don't want to ring all the doorbells. Your friend told you that her house was the smallest of the three so you could compare them at a glance. What you are doing is comparing two at a time, eliminating one and comparing again. This is similar to the way a computer makes comparisons, only it can do it very fast and with a large amount of data.



OUTPUT UNIT

Output devices are often grouped together with input devices, since both are often used at the same time by the same user. The most common output device is the video display terminal, sometimes called CRT for cathode ray tube. The CRT, often called a monitor, can be used to display information as you key in and after it has been processed. While the video monitor is the most common output device, there are many others. Printers, plotters, and numerical control (NC) devices are a few examples. Here are some examples of output devices:

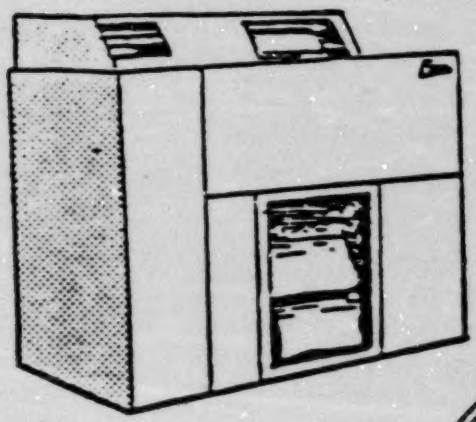
Card punch



Magnetic tape

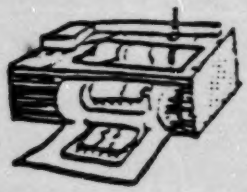
Magnetic disk

Printer

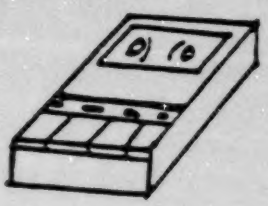


Highspeed printer

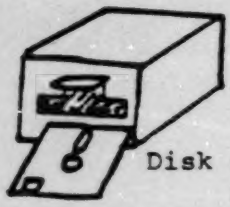
CRT



Graphic plotter



Cassette tape



Disk drive and disk

HOW A COMPUTER WORKS
MATCHING SHEET

1. _____ Conducts the traffic in and out of the computer.

2. _____ Where information is stored.

3. _____ Does math operations in the computer.

4. _____ Information that has been worked on by the computer then goes to a printer or CRT.

5. _____ Information that will be put into the computer.

6. _____ Made up of control and arithmetic unit.

7. _____ Person who operates the computer.

8. _____ Temporary computer memory which is erased when the power is turned off.

9. _____ Permanent computer memory.

10. _____ This devise is used to temporarily view computer OUTPUT.

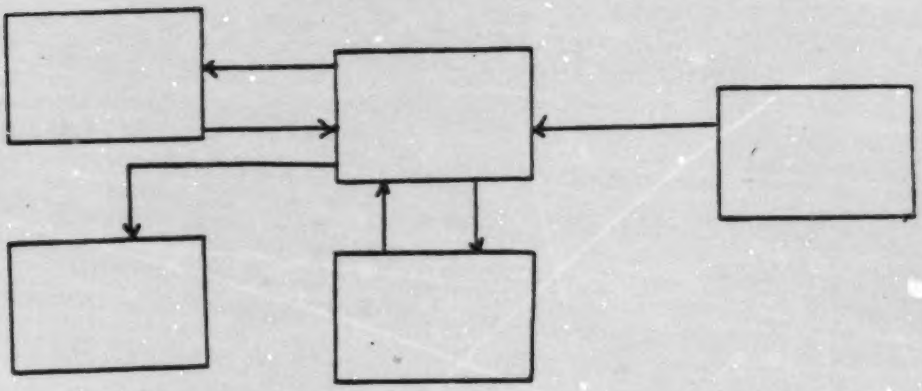
11. _____ Used as both an INPUT and OUTPUT device. Provides permanent storage of information.

12. _____ The INPUT device used to type information into the computer.

a.	input	b.	output
c.	control	d.	CRT
e.	disk drive	f.	keyboard
g.	arithmetic unit	h.	memory
i.	CPU	j.	user
k.	RAM	l.	ROM

Name _____

FIVE PARTS OF A COMPUTER



Write these into the correct box.

Input
Arithmetic Unit
Memory
Output
Control

Using the words above, write the correct word that fits the sentence below.

1. _____ directs traffic of data in and out of input, memory, arithmetic and output.

2. _____ does math operations in the computer.

3. _____ information that will be put into the computer.

4. _____ where information is stored.

5. _____ information that has been processed by the computer.

Computer Skills Improvement in
Vocational Secondary Programs

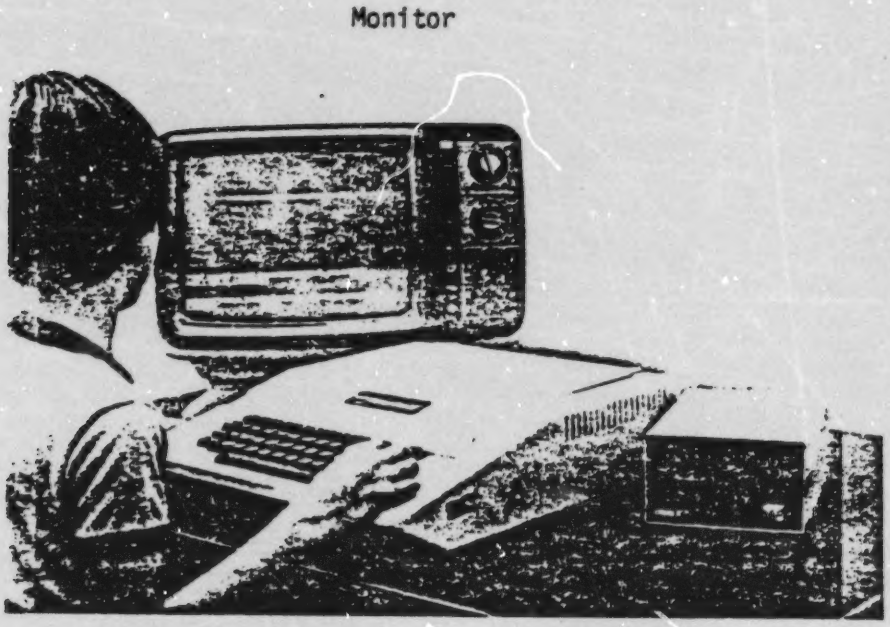
Name: _____ Activity # 3

Title: Operating a Micro-Computer

Introduction: The ability to operate and use a microcomputer system is becoming an essential skill for daily living and for almost any career. The Apple II microcomputer is one of the more popular microcomputers used in educational programs. Because of its extensive use in education, we will use it in this activity. This activity will introduce you to the basic operating skills necessary to use the Apple II plus or the Apple IIe computer.

Directions:

The Apple Computer System



NOTE: This activity was designed for the field test in the foodservices area. You may use this format for computer activities in your area.

Computer and Keyboard

The computer and keyboard are considered computer hardware. The computer houses the central processing unit (CPU), memory and the keyboard. Most Apple II's are capable of using a variety of computer languages and have full color graphics features.

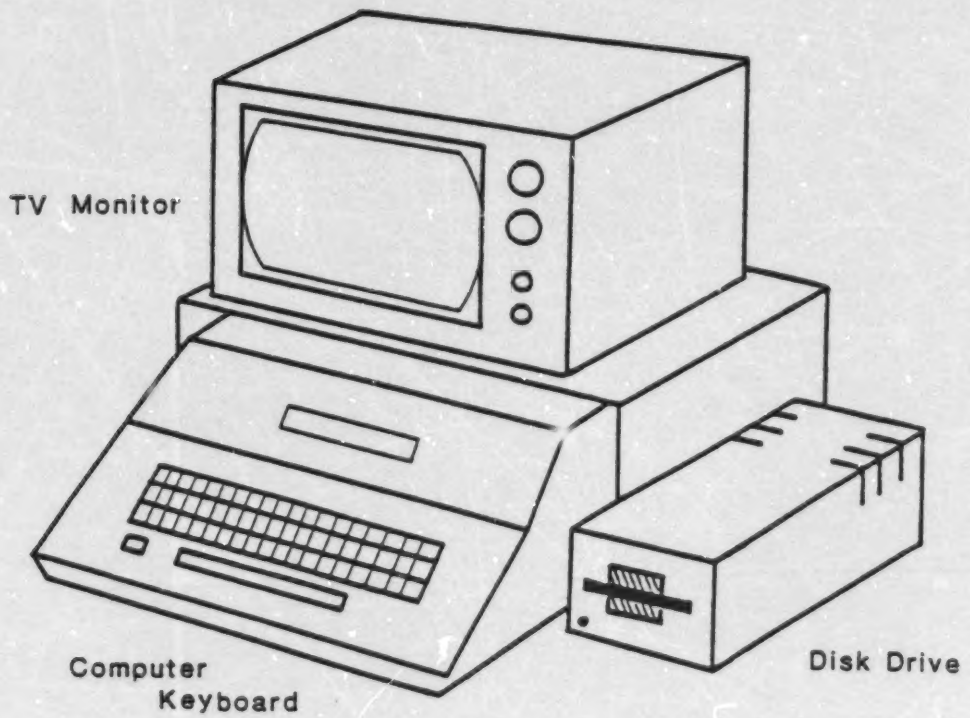
Monitor

This component is also considered computer hardware. A specially designed computer monitor or a regular TV can be used with a radio frequency (RF) modulator that converts the computer's video signal to a TV signal.

Disk Drive

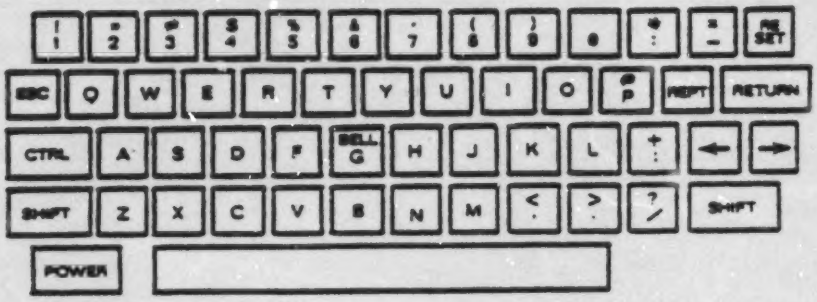
This component is also considered computer hardware. Floppy 5 1/4" disks that contain files or programs are sent to the computer through one or more disk drives.

Apple II Microcomputer



Keyboard Orientation

The Apple keyboard is similar to a typewriter with the exception of some special function keys. This section will introduce you to the Apple II (plus) keyboard.



Return Key — Signals the computer that you have completed entering information and enters it into the computer.

Space Key — Moves the cursor a single space to the right.

Shift Key — While pressing down this key it displays the upper character on the key.

Left (←) / Right (→) Arrows — Moves the cursor to the left or right. These arrows are useful to remove or restore information.

Control Key — A nonprinting character that causes something to happen. The (CTRL) key is held down while the other key is pressed. Examples:

(CTRL) S - stops a program listing.

(CTRL) G - causes the computer to beep

Using the Disk Drive

Use the following set of instructions to insert and remove a disk from the disk drive. In practicing this procedure, use any initialized disk. Learn to handle the disk properly. Disks must be held properly and stored properly or the information on them will be destroyed.

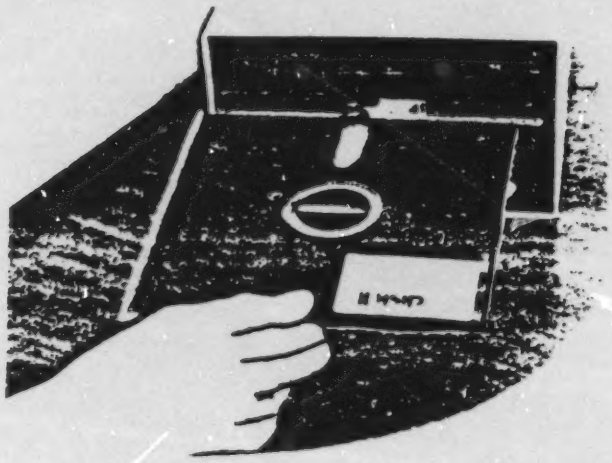
1) Check to see that the IN USE red light (on the disk drive) is off. Turn off the main switch on the computer if the red light is on.

2) Open the disk drive door.

3) Remove the disk from its envelope or holder.

4) Insert the disk with the label facing upward and your thumb on the label into the slot of the disk drive. DO NOT FORCE OR BEND THE DISK.

5) Once the disk is completely inside, push down the disk drive door until it clicks shut.



Removing Disks

A disk is removed from the disk drive by opening the drive door and carefully pulling out the disk. The act of opening the door lifts the head off the disk.

Practice using the keyboard.

1. Make certain that the main computer switch is off.

2. Properly insert any initialized disk into the disk drive.

3. Close the latch carefully.

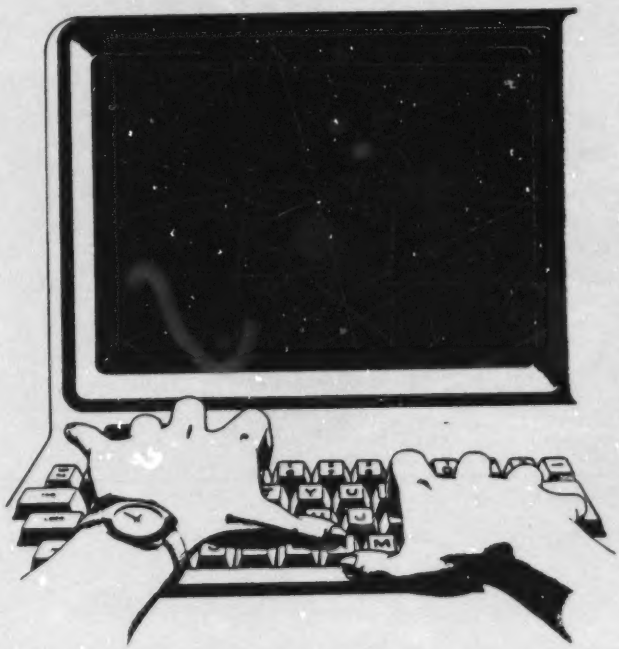
4. Turn on the main switch for the computer and the monitor.

5. When the cursor appears in the lower left corner, type in HOME. This should move the cursor to the upper left corner.

6. Once the cursor appears again complete the activity on the next page titled Special Keys. Any time you want to clear the screen just press the RETURN key and type HOME.

8. Turn off the computer.

9. Carefully remove the disk from the disk drive and place it in the cover.



SPECIAL KEYS

1. Press some keys on your keyboard. What appears on the screen?

2. Do any of the keys cause the computer to make noise? If yes, which ones?

3. Hold down the "shift" key while you press the "M" key. What does that do? The "P" key? Try all of the other keys.

4. If your keyboard has a control (CTRL) key, hold it down while pressing other keys. Try all keys. What happened?

5. What does the long bar on the bottom of the keyboard do?

6. The flashing square on the screen is called the cursor. Can you find a key which moves it in different directions? Which key moves it which way?

7. Type your name, then press RETURN. If you made a mistake, could you correct it? How?

8. List anything the computer did that you would like to talk about.

Computer Skills Improvement in
Vocational Secondary Programs

Name _____ Activity # 4

Title: Using Programs
from a Disk

Introduction: Most microcomputer systems use floppy disks to store computer programs. These computer programs provide the instructions that tell the computer what to do with the information or data that you are processing. This activity will help you learn some of the commands that are used to operate the disk drive and programs.

Directions: Read the instructions carefully and follow the steps below.

1. Make certain that the computer is turned off (the switch is to the left of the keyboard).

2. Properly insert any initialized disk into the disk drive and close the latch.

3. Turn on the computer and the monitor and allow the disk drive to run. You will see the little red light on the disk drive go on, then after it loads the program, the light will go off.

4. Eventually you should see a blinking square on your monitor. You are ready to begin. This blinking square is called the cursor.

5. If you want to get the disk drive to turn on again, type PR#6 and press the RETURN key. This command is used to boot the system. It does the same thing as when you turn on the computer.

6. The command that executes a program in the computer's memory is called RUN. The command that places the program into the computer's memory is called LOAD.

   For example you could type LOAD HELLO and the computer would load the HELLO program from the disk into the computer's memory. If you then typed RUN the computer would execute the HELLO program.

7. Try it and see what happens...

NOTE: This activity was designed for the field test in the foodservices area. You may use this format for computer activities in your area.

8. To list the instructions used to run the HELLO program, type the command LIST. Try it. If nothing happened, try LIST HELLO. What appeared on the screen?

9. Now clear the monitor of all the information that is on it and move the cursor back to the upper left corner. To do this type HOME and press the RETURN key.

   What happened?

10. The computer can also be used as a calculator. The asterisk (*) is used to multiply and a slash (/) is used to divide. Remember the shift key allows you to use the letter or symbol on the upper half of the key.

    Now try some problems:

    Type PRINT 5 * 2 then press the RETURN key.

    What happened? Why did you have to type PRINT?

    Try some division problems.

11. The computer can also do graphics. On the Apple II computer the command GR (graphics) directs the computer to go into the graphics mode. In normal operation the computer can either be in a TEXT mode or GR mode. If you type TEXT it returns to the TEXT mode. You will not use either command now, but instead will try some graphics.

To put a line on the monitor, you use either the command HLIN for a horizontal line, or you use VLIN for a vertical line. If you want to put a block of color on the screen you use the command PLOT.

Try a few graphics:

Type PLOT 6,6 and press the RETURN key.

What happened?

The numbers 6,6 tell the computer where to place the square on a coordinate system.

Now try picking your own points and see what happens.

What did you find out?

To place lines on the screen try using the HLIN and VLIN commands.

Type HLIN 10,90 and press the RETURN key.

What happened?

Try some graphics on your own.

Questions:

1) List the computer commands you learned in this activity.

2. Can you think of a computer program that could be used in the foodservice cluster that could use graphics?

Computer Skills Improvement in
Vocational Secondary Programs

Name: _____ Activity # 5

Title: Computer Test

Introduction: To be able to use computers effectively it is important to become familiar with the most common computer commands. This activity will be a review of many of the commands you learned in the last activities. It is not graded, it is meant to help you review some of the commands you will need to know.

Directions: Put any initialized disk into disk drive #1. Be sure to handle the disk carefully. Turn on the computer. When the cursor appears in the lower left hand corner of the screen, type RUN COMPUTER TEST. Read and follow the instructions carefully. By moving the cursor up and down you and your partner will try to match each term with its definition.

Questions:

1) How did you do? Did you get most of them right the first time?

2) Can you think of some commands that were not on the test?

NOTE: This activity was designed for the field test in the foodservices area. You may use this format for computer activities in your area.

Name: _____ Activity # 6

Title: Lemonade Stand

Introduction: This activity is a computer simulation of operating a simple foodservice business. In this example you and your partner will simulate operating a lemonade stand. You will determine how much lemonade to make, how much advertising you need, and how much to charge for lemonade. Based on the weather and demand for lemonade you may or may not make a profit.

Directions: Put any initialized disk into disk drive #1. Turn the computer on. The red light on the disk drive should appear. This indicates the disk drive is loading the information from the disk into the computer. Read the instructions on the computer carefully. Both you and your partner will play, so tell the computer that there will be two people playing. Each team will operate their lemonade stand for three days.

Activity: Each of you will determine how much lemonade to make, how much to charge per glass, and how much advertising to purchase per day. Your sales each day will determine your profits and assets at the end of each day. Record the profits and assets for each day and for each person.

	Day	Profit	Assets
First person	1		
Name:	2		
	3		
Second person	1		
Name:	2		
	3		

NOTE: This activity was designed for the field test in the foodservice area. It is based on a commercially available program titled "Lemonade Stand". Information on ordering this specific program may be found in the Resources section

Questions:

1) Who finished with the greatest profit? What different things caused your profits to increase or decrease?

2) Many variables can cause a restaurant or snack stand to have more or less business. What are three variables that were not accounted for in this computer simulation?

3) Computer programs can be used to simulate real situations. What are two other examples of foodservice activities that a computer could simulate?

Name: _____ Activity # 7

Title: Snack Master

Introduction: Another one of the advantages of a computer is its ability to randomly select things from a list. This computer program has a list of snacks and calorie count. It will ask you to select the snack with the lowest calorie count from a list of three snacks. After you make ten choices, it will total the calorie count. If your total is less than 1200, you earn the rank of, "Snack Master First Class." If your total is less than 1000, you earn the rank of "Snack Master of the Highest Order." You and your partner may each try it twice.

Directions: Put the disk marked Fast Food in disk drive #1. Turn on the computer and monitor. Read the instructions carefully as they appear on the screen. Choose the snack that you think has the lowest number of calories.

Questions:

1) What were your calorie totals?

First person: First time -

Second time -

Second person: First time -

Second time-

2) What snack had the lowest number of calories?

3) What snack had the highest number of calories?

4. What other type of list could you store on a computer program that would be related to food service?

NOTE: This activity was designed for the field test in the foodservice area. It is based on a commercially available program titled "Snack Master". Information on ordering this specific program may be found in the Resources section

Computer Skills Improvement in
Vocational Secondary Programs

Name: _____ Activity # 8

Title: Fast Food

Introduction: Two of the important advantages of computers are their ability to store lots of information and perform calculations quickly. In this activity, the computer program will help you evaluate a meal at a fast food restaurant. The computer program has the menus of 11 common fast food restaurants in its memory. It will allow you to order your meal, then it will show you the calories, fat, protein, and vitamin analysis of your meal. You and your partner may each try two meals.

Directions: Put the disk marked Fast Food in Disk Drive #1. Turn the computer on. Read the instructions as they come on the computer screen carefully. Answer each question accurately. After you choose the fast food restaurant and the meal you want, the computer will ask you if you want to use the printer. If you want a printed copy of the analysis of your meal, type yes. Tell the computer the printer is in slot 1. When you are finished let your partner try. You and your partner may each try two meals.

Questions:

1) How did the computer determine the number of calories you need per day?

2) What was the most nutritious meal either you or your partner ordered? Name the restaurant and list the menu.

3) Where and how could you use a computer program like this?

NOTE: This activity was designed for the field test in the foodservice area. It is based on a commercially available program titled "Fast Food". Information on ordering this specific program may be found in the Resources section

Computer Skills Improvement in
Vocational Secondary Programs

Evaluation Form

Name: _____

The purpose of this evaluation form is for you to tell us about the activity you just finished. You will not be graded on your answers below. Thank you for your help and comments.

Approximately how long did it take for you to do the entire activity?

____5 min____10 min____15 min____20 min____30 min or more

I thought this activity was... (check only one answer)

____ very easy to understand

____ easy to understand

____ hard to understand

____ very hard to understand

Why do you think this activity was easy or hard for you?

Check "yes" if you agree or "no" if you disagree with each of the statements listed below.

YES	NO	This activity ...
____	____	was interesting.
____	____	was fun.
____	____	was boring.
____	____	was related to foodservice.
____	____	didn't relate to foodservice
____	____	helped me to learn more about computers.
____	____	helped me learn how computers are used in foodservice.
____	____	took too much class time.
____	____	will help me in my future job or career.

Use the back of this sheet for any other comments on the activity

Terminology

Interacting with communications technology, such as a microcomputer, involves the utilization and comprehension of terminology, jargon, and buzz-words associated with the system(s). This section provides a glossary of the expressions or terms which are prevalent in vocational applications. This listing, although extensive, does not include all of the words associated with computer utilization. It is designed to provide a base from which the vocational teacher can build a computer vocabulary.

A

Abort	To stop or cancel a procedure or selection in progress.
Absolute Address	The actual, physical location in storage of a piece of data that the control unit can address directly.
Access	The ability to obtain data from and/or place it into memory.
Access Time	The time it takes for information to become available once it has been called for via a control signal.
Acoustic Coupler	A device which allows a computer to talk over telephone lines. It has a cradle in which the telephone receiver fits. Electrical impulses from the computer go to the acoustic coupler which converts them into tones. These tones go out through the telephone receiver.
Active File	A file that is currently in use. In some computers which many people can use at once, if a file is active (someone is using it) no one else can use it.
Adapter	A connecting device with the plug for one kind of cable and the socket for another. It is used when the cables used to connect parts of a computer do not fit each other.

Address	An identification represented by a name, label, or number for a register or location in storage.
Alphanumeric Data	Data that consists of letters of the alphabet, numerals, and other characters that can be entered through a keyboard.
Analog	The representation of a variable using physical quantities such as electrical voltage or mechanical pressure.
Analog Computer	An automatic computing device that operates in terms of continuous variations in some physical quantity, such as electrical voltage or mechanical displacement. Analog computers are primarily used to solve differential equations.
Animation	Making an inanimate object or drawing appear to move by rapidly displaying a series of pictures of it, each one in a slightly different position.
Application Software	Software that is designed to allow a computer system to perform tasks within specific disciplines such as architectural, structural, mechanical, and electronic drafting within computer aided drafting.
Architecture	The arrangement, design, and interconnection of components within the system. Also refers to the internal design of the microprocessor.
Arithmetic Component	The part of a computer system's processing unit that performs all mathematical computations.
Assembler	A computer program that transforms mnemonic instructions into binary code.
Assembly Language	A low-level computer language with a set of mnemonic instructions usually having a one-to-one relationship with machine code.

Teachers at the turn of the century will have personal knowledge of but a small portion of what youngsters will learn. Much of the knowledge attained by individual persons will be idiosyncratic.

--R. Stahl

B

Back-up	Duplication of a program or file onto a separate storage medium so that a copy will be preserved against possible loss or damage to the original.
BASIC	Beginners' All-purpose Symbolic Instruction Code--A high-level programming language that is widely used by beginners and in simple interactive computing.
Batch Processing	The running of computer programs in groups or batches.
Binary	The base-two number system that uses only zeros and ones.
Bit (binary digit)	The smallest unit of digital information that can only take on values of zero or one.
Block	A generic term for any kind of grouped data (bits, bytes, words, records) handled as a single unit. It is often associated with a contiguous group of records on a disk and is accessed as a unit.
Bootstrap	A program or machine routine that is designed to bring the computer into the operating state.
Break	A interruption of transmission.
Buffer	A temporary storage location for data. Buffers are typically used in conjunction with slow input device to better utilize computer speed.
Bug	An error in programming that causes faulty output. May also mean a hardware malfunction or design error in the computer.
Byte	A basic unit of information in a computer. Commonly consists of a sequence of eight binary bits, usually handled as a unit. One byte usually represents one character.

Our machines are so complicated,
the human element doesn't enter
into them.

--IBM Spokesperson,
quoted by New Yorker,
1946

C

CAD	Computer Aided Drafting--A system of hardware, software, and users grouped together in such a way as to perform necessary drafting tasks.
CMI	Computer Managed Instruction--The use of computer programs in the management or administration of an instructional program.
CAI	Computer Aided Instruction--An educational procedure supported and assisted by computers; this includes electronic tutorials and automated worksheets. Also termed Computer Assisted Instruction.
CAM	Computer Aided Manufacturing--system using the computer and peripheral equipment to create the data base for programming the operation of manufacturing equipment such as lathes, milling machines, and drilling machines.
Card Reader	A device that can transcribe punched-hole data from paper cards into electrical impulses for input into computer memory.
Cassette Recorder	A device for storing information. Binary information is stored on a cassette tape by first converting it to audio signals and recording it on the tape. This method of storing is slower than disk.
Catalog	An ordered set of items, such as files or programs, arranged in an easy to reference structure. To index a set of items, such as a list of files.
Central Processing Unit (CPU)	Central Processing Unit controls what the computer does. It includes three main sections: arithmetic, control, and the logic elements. It performs computations and directs the functions of the computer.
Character	Single items that can be arranged in groups to stand for information. There are two forms: (1) numbers, letters, graphic symbols, etc., that can be understood by people and (2) groups of binary digits that can be understood by the computer. Character is usually represented by one byte.

Character Generator	A device used to move a CRT beam across the screen to trace the shape of an alphanumeric character.
Chip	A small, flat piece of silicon on which electronic circuits are etched. As the heart of a microcomputer, this microprocessor contains all the circuitry needed to carry out computer operations.
Clock	An internal device, typically a crystal oscillator, used to synchronize the timing of basic events in the computer.
COBOL	Common Business Oriented Language--A high-level programming language especially useful in business applications.
Code	A sequence of program instruction to perform a specific computer task. Usually, machine code is considered to be binary.
Coding	Developing a set of computer instructions or translating "human readable" material into "computer readable" material.
Command	An instruction given to the computer through an input device or peripheral.
Compatibility	There are two types of compatibility--hardware and software. Hardware compatibility means that various components (printers, disks, keyboards, etc.) may be directly connected without intervening electronic devices and that all components use the same baud rate (i.e., data transmission speed), word length, and other technical aspects in order to communicate. Software compatibility refers to the ability to run programs on a variety of computers without changing the program language.
Compiler	A computer program that translates high-level program statements into machine language.
Computer	A device designed for the input, storage, manipulation, and output of symbols (digits, letters, punctuation). It can automatically follow a step-by-step set of instructions to manipulate information.

Computer Graphics	The process of delivering to the user pictorial representations of information through information processing techniques; e.g., graphs, drawings, etc.
Computer Literacy	General learning, knowledge, and fluency with computer terms and computer usage.
Computer Program	A series of instructions which the computer will follow. Each program is designed to cause the computer to perform a specific task or solve a specific problem.
Core	The main storage area in a computer. Also, in early computers, a small ferrite ring which could be magnetized to form one bit of information.
Courseware	A combination of content, instructional design, and the physical program (software) that causes a computer to complete instructions.
CPU	Central Processing Unit--The heart of a computer system consisting of the controlling circuits, main storage, and the arithmetic-logic unit.
Crash	The condition of a system that has become unusable; the cause may be either a hardware malfunction or a software problem.
CRT	Cathode Ray Tube--A common display device resembling a television picture tube that operates using an electron beam focused on a phosphorus screen. In some cases a TV may be used for this purpose.
Cursor	A movable character or symbol, such as an arrow or rectangle, that indicates the current grid position on a screen.
Cycle Time	The amount of time associated with the most fundamental sequence of computer executions, usually measured in terms of the number of beats from an internal crystal clock. Typical cycle times are measured in terms of nanoseconds.

D

Data	The information given to or received from a computer. Data can be represented by binary digits such as alphanumeric data and other characters that appear on a keyboard.
Data Base	An organization of data files containing information or reference material on a particular subject or subjects. It is typically structured so that headings or keywords can be referenced easily, which allows efficient and simple access, to and retrieval of, records.
Data Processing	The input, storage, manipulation, and dissemination of information using sequences of mathematical and logical operations.
Data Set	A group of data elements that are related.
Debug	The process of finding and correcting errors in a program that might cause problems or provide inaccurate information.
Decimal	The base-ten number system.
Default Value	The value or state that a variable will assume if no pre-empting information is supplied.
Density	The amount of information that can be packed onto a tape or disk. Usually expressed in units of bits per inch (BPI).
Digital	The representation of information using discrete numerical values.
Digitizer	The hardware component in a computer aided drafting system that is used to convert graphic data into digital data. Either a hand held cursor or an electronic/light pen is used as an input device.
Direct Address	An address that refers to a memory location which contains the operand desired.
Direct Memory Access	The transfer of data from memory directly to peripherals.

Disk (disc)	Magnetic-coated material in a 5 1/4 inch or 8 inch record-like shape on which information and programs are stored. Information is stored randomly and can be accessed faster than on cassette tape storage, sometimes called diskettes or floppy disks.
Disk Drive	A device that rotates magnetic disks and accesses its data by means of a read/write head. Disk drives are operated by disk-drive controllers and utilize the principle of random-access storage.
Display	Any visible data coming directly from a computer. Text or pictures on a monitor are examples of computer displays. The same data printed on paper would not be a display.
Documentation	The inclusion of information that supports or explains a software package. A computer program that can be documented using comment cards.
DOS	Disk Operating System--Software routines used to operate computer systems where disk storage is used.
Dot Matrix Printer	A printer that can print groups of tiny dots on a piece of paper. These dots may be arranged into the shape of alphabet letters. They also may be arranged to create a picture.
Double Density	A technique used to increase bit density on a magnetic storage medium to twice the amount of single density so that more information can be stored in the same amount of area.
Double-sided Disk	A magnetic disk capable of storing information on both sides.
Down Time	Any time a computer is turned off. Down time can be caused by a malfunction, maintenance, or modifications.
Drum Plotter	A computer output device that generates graphics on paper stretched over a cylindrical surface.

Dump	The transfer of programs and data onto an auxiliary storage device or the listing of all the contents of a working storage area.

E

Editor	A system utility program that allows the user to change or correct a program with simple commands.
Eighty-column Card	A printed circuit board which can be plugged into a microcomputer so that its video display is expanded from forty columns across to eighty columns across. Better word processors use an eighty column format because a typed page usually is more than forty characters across.
Electronic Mail	Messages sent by one user and retrieved by another through an electronic service system, usually via telephone lines or radio transmission.
Electronic Spreadsheet	Software that simulates a business or scientific worksheet in which the user can indicate data relationships. When data are changed, the program has the ability to instantly recalculate any related factors and to save all the information in memory.
Electrostatic Plotter	A plotter that employs a fixed writing head with addressable electrodes. The electrodes place a charge on a coated paper that is passed through a toner.
Embedded Command	One or more characters inserted into the text that do not print but instruct either the printer or word processing program to carry out a task.
EPROM	Erasable or Electrically Programmable Read Only Memory--PROM can be erased and reprogrammed.
Erase	Remove data from memory. This can be main memory, inside the computer, or mass storage, such as on a disk or tape.

EROM	Erasable Read Only Memory--A ROM can be erased and reprogrammed.
Error	A mistake in a program or made by a user. Such a mistake prevents a computer from performing some operation.

F

Field	The most detailed unit of information storage. A file is divided into records and a record is divided into fields.
File	An organized block of information.
Firmware	Programs that are contained in a hardware device like ROM.
Fixed Point	An integer mode with no decimal point.
Flicker	An intermittent image caused by having more lines displayed on a CRT than can be refreshed before the phosphor fades. It is a characteristic of a CRT using only a vector generator.
Floating Point	Ability to work with a real number having decimals.
Floppy Disk Drive	A device for storing masses of information on a rotating, flexible, magnetic-coated plastic disk that is similar to a record. Information can be stored and quickly retrieved. Unlike cassette tapes the disk allows the user to go to any section of the disk without searching through immediate information.
Flow Chart	A graphical aid for understanding the logic of a program.
Format	The way information is arranged. The size of files on a disk is part of that disk's format.
FORTRAN	FORmula TRANslation--A programming language developed for use on IBM computers and often preferred by scientists and engineers.

Function Key	A control on an interactive computer system that will cause specific operation to be performed such as constructing a circle or deleting a line.

G

Gap	Empty space left between blocks of information on a disk or tape. A gap allows the computer to tell where one block of information ends and another begins.
Graphic Data	Data that is represented by lines and planes such as sketches and drawings.
Graphics	Information displayed in the form of pictures.
Graphics Tablet	A flat device which plugs into a computer for the purpose of drawing a picture or digitizing. The information will be sent to the computer and included in a program or displayed on the CRT.
Grid	A surface that is divided into squares, like graph paper. A computer display may be marked into a grid, which aids in creating graphics.

H

Hard Copy	Output that can be taken from the system. The most common types of hard copy are printouts, drawings, and plots. Also a small photocopy of what appears on the CRT.
Hard Disk Drive	A peripheral device for storing programs or other information on disks made of rigid aluminum, coated with a magnetic recording surface. The most common form of storage on large computer systems.
Hardware	The physical components of a computer system, consisting of the central processing unit plus all of the peripherals (CRT, disk drives, plotter, printer, etc.).

Hexadecimal	A numbering system using the base sixteen.
High-Level Language	A language like FORTRAN or BASIC where simple statements can cause a great deal of computation.
Hybrid Computer	A computer having both digital and analog components.

I

Image	A picture created with an optical instrument, such as a television camera, a film camera, a xerox machine, an exact copy of a section of memory that has been transformed to another section of memory or to a different location in mass storage.
Impact Printer	Any printer which puts data on paper by striking an inked ribbon. Impact printers may form letters out of dots or with raised faces like typewriters.
Indirect Address	An address that refers to a memory location which contains the address of the operand desired.
Initialize a Disk	A process performed automatically by a computer. It records various signals on the disk which become markers. Afterward, the computer can find a location on the disk by counting these markers.
Input	Information going into the computer or into a peripheral device. The same data may be output from one part of the computer system and input into another part of the computer.
Integrated Circuit (IC)	A solid state device that contains many electronic circuits on one small chip.
Intelligent Terminal	A terminal with some computing and storage capabilities of its own.
Interactive System	A system that allows the user to edit or change, and to receive output almost immediately.

Interface	An electronic circuit that connects the CPU and a peripheral device (disk drive, etc.), permitting the flow of data back and forth.
Interpreter	A translation procedure that translates and immediately executes each step of the source program one step at a time.
I/O	Input-Output--Information that is input to or output from a computer.

J

Joystick	A method of manipulating a cursor on the screen or a display by tilting a lever in the desired direction of movement.

K

Keyboard	A console of keys such as those on a typewriter. The keyboard is usually attached to or a part of the CPU. The keyboard is used for input of data/information.
Keypunch	A keypunch is a typewriter-like device that punches holes in computer cards.

L

Language	A format that allows a programmer to communicate more effectively with a computer. BASIC is one of the most popular and easily used languages. A language is a defined group of representative characters or symbols, combined with specific rules necessary for their interpretation by the computer.
Library	A collection of standard programs and sub-routines made available to the user for repeated use or incorporation into other programs.

Light Pen	A digitizing device that senses the glowing phosphor on the cathode ray tube and as a result changes a function or sends a signal to the computer.
Line	This term has two meanings. One is a line drawn by a computer as part of a graphic. The other meaning is a line of text on a display or a typed page.
Line Feed	The act of advancing to the next line of text. This might be moving the cursor down one line on a monitor display or advancing the paper in a printer so that it types on the next line.
Line Number	Programs written in some programming languages are organized by lines. Each line contains one or more instructions. Each line is given a number and the computer begins executing the program with the lowest-numbered line.
Listing	A display or print-out of a program.
Load	This term has two meanings. One is to transfer data from mass-storage into a computer s internal memory. The other meaning is to put a storage medium, like a disk or tape cassette, into the device which can "read" it, to a tape player.
Location	An area of computer storage which is identified by its own address.
Loop	A sequence of instructions which may be executed repetitively.
LPM	Lines Per Minute--Normally used to indicate the capacity of a printer.
LSI	Large Scale Integration--The most complex form of an integrated circuit.

M

Machine Language	A sequence of binary instruction code used directly by a machine. The code is in a form directly acceptable to a machine and requires no translation.
Magnetic Tape	A plastic tape on which data can be stored by selected magnetization of positions on the surface. The usual density of information is 800 BPI (Bits Per Inch).
Main Memory	Another term for internal memory; the memory within a computer, as distinct from memory stored on tapes, disks, or other mass storage.
Main Program	A main program is a set of instructions used to begin the operation of the computer on a program and can be used to call subroutines or subprograms.
Matrix	A rectangular array of elements used for displaying digital data.
Matrix Printer	A type of printer that outputs alphanumeric data by creating characters consisting of small dots arranged in a matrix. Matrix printers can print as many as 180 characters per second.
Memory	The integrated circuit of a computer that can execute instructions and serves as the brains of the CPU.
Menu	A set of symbols on a display allowing the operator to select the next operation on an interactive system.
Microcomputer	A computer whose central processing unit is a microprocessor.
Microprocessor	An integrated circuit that executes instructions, also a central processing unit on a single chip.
Microsecond	One millionth of a second.
MODEM	MOdulator-DEModulator--It is a device that permits computers to transmit information over regular telephones lines.

Monitor	A video display unit that uses a cathode ray tube (CRT) to generate characters. It looks like a normal TV set; however, the monitor has a much higher degree of resolution, which permits the clear formation of very small characters on the screen.
Multiplexer	An interconnecting device between a central processor and two or more similar peripheral devices so they can effectively operate simultaneously on a single channel.
Multiprogramming	The simultaneous working of two or more different programs in a single computer.

N

Nanosecond	One-thousandth of a microsecond.
Noise	Random interference in electronic circuits.
Numerical Control	A type of computer aided manufacturing in which electric motors receive instructions electronically from punched paper tape, or magnetic tape fed through a reader that automatically operates machine tools.

O

Off-line	Refers to the location of data on storage devices that are not immediately accessible to the computer. Data stored on magnetic tape, punched cards, or paper tape must be loaded into on-line storage to be available to the computer.
On-line	Refers to the location of data on storage devices that are immediately accessible to the computer. Usually on-line data are stored on discs, in RAM, or in ROM.
Operating System	A collection of service routines that supervise the sequence in processing of programs on a computer.

Operational Software	Computer software that causes the system to perform the basic general functions such as storage, plotting, and calling from storage.
Optical Scanner	A device that examines or senses a multi-dimensional pattern and generates an analog or digital representation of the pattern.
Oscilloscope	An oscilloscope is a CRT device commonly used for computer fault finding and preventative maintenance.
Output	Information coming from the microcomputer to a display unit, such as a CRT or printer.
Overflow	The production of a number beyond the capacity of register.
Overlay	A technique for bringing routines into high-speed memory from peripheral storage during processing so that several routines will occupy the same memory locations at different times.

P

Paper-Tape	A method of representing information by patterns of punched holes in a length of tape, commonly used in numerical control N/C devices.
Parallel Operation	Flow of data through a computer or any part of it using two or more channels simultaneously.
Parallel Storage	Storage in which each bit in some piece of information or storage area is accessed simultaneously, contrasts with serial storage when the bits are read or written one after the other.
Peripheral	A general term for devices which may be connected to a computer's central processor.
Plotter	A hard-copy device capable of presenting data in graphic form, such as two-dimensional curves or line drawings.
Port	A term that refers to locations where the computer can receive or send signals.

Printer	A peripheral device that accepts output data from the microcomputer and prints on paper. Printers are defined as impact or nonimpact. Impact printers strike the paper by a ribbon like that on a typewriter. Nonimpact printers form characters by electrical charges or by spraying ink.
Processor	The heart of the computer configuration holding the circuitry for arithmetic and logical operations.
Program	The set of instructions by which a computer operates to accomplish a specific task.
PROM	Programmable Read-Only Memory--A memory device (ROM) that can be programmed after it is manufactured.
Prompt	A character or mark that appears on a CRT display indicating that the computer is waiting for the user to enter data.

Q

Queue	A waiting line for processing jobs or data.

R

RAM	Random Access Memory--The computer's general purpose memory. RAM may be written into or read from the central processing unit. RAM can be erased and re-programmed by the programmer as frequently as necessary. RAM disappears and will be lost when power to the computer is turned off.
Random Access	A memory device that may have any portion of the memory located independently of time. Access to the memory data may be in a random manner.

Raster Scan	A CRT scanning system where the beam moves horizontally across all x-values first at each y-level, moving sequentially down each y-level until the entire screen is scanned.
Reader	A general term for a hardware component that is used for interpreting the instructions set forth on punched paper tape or magnetic tape.
Real Time	Data processing with results displayed during the actual time the physical process occurs.
Record Length	The size of a data element or elements.
Refresh Display	A type of CRT display that creates an image using an electron beam. The image must be refreshed approximately 60 times per second or it will begin to flicker.
Register	Temporary working storage device for control, arithmetic operations, and logic.
Repeatability	The capability of a pen plotter in a computer aided drafting system to retrace a line or lines without altering its width.
Resolution	The smoothness of curves plotted on a computer. The smoother the curves the higher the resolution.
ROM	Read Only Memory--A circuit where data or instructions are programmed at the time of manufacture. ROM cannot be erased during normal operations. ROM is fixed, not volatile.
Routine	A set of machine instructions that will perform a specific job (program).

Our competitive position in the international economy is dependent on the ability of this country to produce well-educated, skilled and creative workers.

--Sen. Frank Lautenberg (NJ)
Speaking upon the introduction of the Computer Education Assistance Act of 1984

S

Satellite Terminal	An input/output device with a small processor that is remote from the central computer.
Scaling	Magnifying or reducing the picture of a display device.
Sector	A disk is divided into tracks which are in turn divided into sectors. Tracks are concentric circles on the disk, and each track is divided into a number of sectors. A file may be recorded in more than one sector and on more than one track.
Serial	Time sequencing of two or more processes or units.
Simulation	A computer program that models some real phenomena or system.
Software	Refers to programs and accompanying documentation. Software is stored on tape cassettes or disks when not being used by the computer. The computer reads the software into its memory in order to use the programs.
Source Program	Instructions written in high-level computer languages.
Speed	The rate at which a task is accomplished or the rate at which it performs.
Spooling	An interconnecting device that allows slow-speed and high-speed devices to interface.
Spreadsheet	A computer program (presented in table form) that allows the user to easily manipulate large amounts of figures and other data.
Stack Memory	A group of storage devices or elements where data is stored serially.
Step	One operation in a program or routine.
Storage	Saving of data in the memory bank of a computer system.

Storage Capacity	The quantity of bytes the storage unit can hold. Due to the large memory capacity of many microcomputers, it is usually expressed in kilobytes (i.e., "thousands" of bytes.)
Subroutine	A portion of program dedicated to a specific operation.
Symbol Creation	The process wherein commonly used symbols are entered into the computer, displayed on the CRT, and then stored in memory. The symbols themselves are placed on a menu for easy reference and accessing.
Synchronous	A computer operation in which each operation follows the pulse of a master timing device.

T

Tablet	A device which may be electronic or acoustic for digitizing data preparatory to input into the computer system.
Tape Reader	A hardware device for interpreting the instructions on punched paper tape used in a computer aided manufacturing system.
Teletype	An electric typewriter-like device that may serve as either input or output.
Terminal	A peripheral device that facilitates human communication with a computer. Usually consists of a keyboard with alphabetic and numeric characters coupled with a printing mechanism or a CRT. One enters information via the keyboard and the computer responds via the printer or CRT.
Time-Sharing	Multi-user sharing of computer time simultaneously.
Track	The part of a dynamic storage device that is accessible to a reading or writing device.
Translator	A program or routine that will convert a program in one language to equivalent statements in another language.
Turn-A-Round	Time between input of data until receipt of the output requested.

U

User — The third component in a computer system. Any person who uses a computer system to perform any type of computer task.

User Software — Special user designed software developed to meet specific on-the-job needs. The most common user software is the menu.

Utility Routine — A standard routine used to assist in the computer operation or program preparation.

V

Video — Loosely, another word for television, the use of electronics to send and record pictures.

Videodisk — A thin, flat, rigid disk about the size of a 33 1/3 rpm phonograph record. Digital data is stored on a video disk in the form of tiny bits. Television pictures may be recorded digitally, as millions of ones and zeros on the disk. Most video disks are "read" by beams of laser light, and therefore, never wear out.

Vector Scan — The direct movement of the electron beam in a CRT from point to point.

The most advanced school systems are the ones that have moved away almost completely from the computer literacy approach and the programming language approach and use the computer as a learning tool.

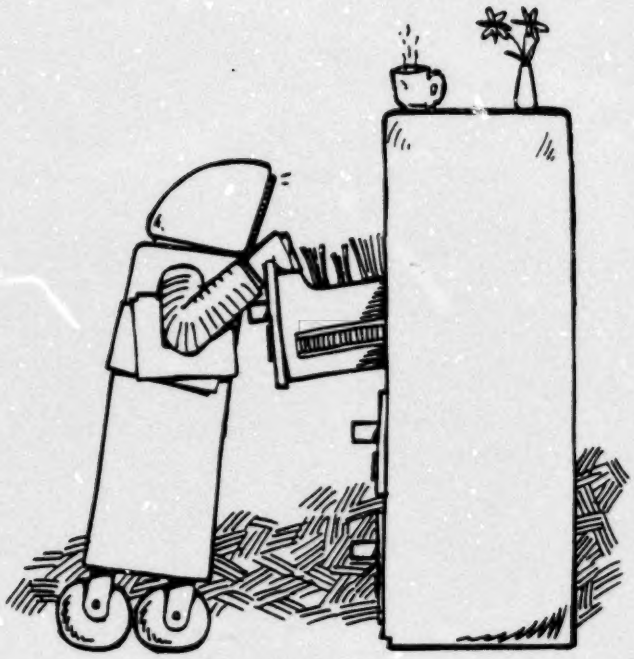
--Dr. Mary Alice White
Director, Electronic
Learning Laboratory
Teachers College of Columbia
University, NY

W

Word	A sequence of bytes operated as one unit.
Word Length	Number of bits in a word, for example, a 16-bit word has two bytes.
Working Space	Temporary storage locations for performing current operations.
Write	To transfer data from one storage area to another or to output.

Z

Zooming	A continuous scaling of data on a display.



The lack of high quality software has been a major frustration for teachers ever since the microcomputer first started appearing in classrooms, but that situation is rapidly changing. As the number of computers in the schools has increased, so too has the availability of courseware.

--Linda Tarr-Whelan, Director of Government Relations National Education Association, Speaking to the House Sub-committee on Science, Research and Technology

Resources for Vocational Education

Journals & Magazines

The following is a compilation of journals, magazines, and newsletters providing general and specific computer application information. Many are hardware specific which is indicated in their title. These references will provide excellent background information and often include listings of software and/or programs in their publications.

AARDVARK/Journal for OSI
AARDVARK Technical Services
1690 Bolton
Walled Lake, MI 48088

ADCIS NEWSLETTER
Computer Center
Western Washington University
Bellingham, WA 98255

THE ALTERNATE SOURCE
1806 Ada
Lansing, MI 48910

APPLE ASSEMBLY LINE
S-C Software
Box 280300
Dallas, TX 75228

APPLE EDUCATION NEWS
Box 20485
San Jose, CA 95106

APPLE EDUCATORS' NEWSLETTER
9525 Lucerne Street
Ventura, CA 93004

APPLE MAGAZINE
10260 Bandley Drive
Cupertino, CA 95014

APPLE ORCHARD
910A George Street
Santa Clara, CA 95050

APPLEGRAM
Apples B.C. Computer Society
316-8Ø55 Anderson Road
Richmond, B.C.
Canada V6Y 1S2

APPLESEED
Softwide Publication
6 South Street
Milford, NH Ø3Ø55

THE APPLE SHOPPE
Apple Shoppe
PO Box 71Ø1
Placentia, CA 9267Ø

BOUNTY
1771Ø De Witt Avenue
Morgan Hill, CA 95Ø37

BUSS
325-B Pennsylvania Ave. SE
Washington, D.C. 2ØØØ3

BYTE: The Small Systems Journal
McGraw-Hill
7Ø Main Street
Peterborough, NH Ø3458

Calculators/Computers
DYMAX
PO Box 312Ø, Dept. 42
Menlo Park, CA 94Ø25

CALL-A.P.P.L.E.
3Ø4 Main Avenue South
Suite 3ØØ
Renton, WA 98Ø55

THE CATYLIST
1259 El Camino Real
Suite 275
Menlo Park, CA 94Ø25

CLASSROOM COMPUTER LEARNING
Intentional Educations, Inc.
51 Spring Street
Watertown, MA Ø2172

CLASSROOM COMPUTER NEWS
Box 266
Cambridge, MA Ø2139

CLOAD
Box 1267
Goleta, CA 93017

COMPUKIDS
Box 874
Sedalia, MO 65301

COMPUTERTOWN USA!
Box E
Menlo Park, CA 94025

COMPUTE
Compute
PO Box 5119
Greensboro, NC 27403

The Computing Teacher
Computing Center
Eastern Oregon State College
La Grande, OR 97850

The Computing Teacher
Department of Computer and Information Science
University of Oregon
Eugene, OR 97403

Creative Computing
Creative Computing Press
Box 789-M
Morristown, NJ 07960

CUE NEWSLETTER
Independence High School
1776 Educational Park Drive
San Jose, CA 95133

Dr. Dobb's Journal of Computer Calisthenics and Orthodontia
People's Computer Co.
Box E, 1263 El Camino Real
Menlo Park, CA 94025

EDUCATIONAL COMPUTER MAGAZINE
Box 535
Cupertino, CA 95015

EDUCATIONAL TECHNOLOGY
140 Sylvan Avenue
Englewood Cliffs, NJ 07632

ELECTRONIC EDUCATION
Electronic Communications, Inc.
Suite 220
1311 Executive Center Drive
Tallahassee, FL 32301

ELECTRONIC LEARNING
Scholastic Inc.
Box 2001
Englewood Cliffs, NJ 07632

Illinois Series on the Educational Applications of Computers
College of Education
University of Illinois
Urbana, IL 61801

INFOWORLD
Circulation Department
375 Cochituate Road
Framingham, MA 01701

Interface Age
McPheters, Wolfe and Jones
16704 Marguardt Avenue
Cerritos, CA 90701

IRIDIS
Box 550
Goleta, CA 93017

Journal of Computer-Based Instruction
Computer Center
Western Washington University
Bellingham, WA 98225

Journal of Courseware Review
Box 28426
San Jose, CA 95159

Kiloband Microcomputing
1001001 Inc.
Pine Street
Peterburough, NH 03458

MICRO
Box 6502
Chelmsford, MA 01824

MICROCOMPUTING
Box 977
Farmingdale, NY 11737

80 MICROCOMPUTING
1001001 Inc.
Pine Street
Peterburough, NH 03458

Micro; The 6502 Journal
Micro
Chelmsford, MA 01824

NIBBLE
Box 325
Lincoln, MA 01773

Oregon Computer Teacher
Oregon Council of Computer Education
Computer Center
Eastern Oregon State College
La Grande, OR 97850

PEEK(65)
62 Southgate Avenue
Annapolis, MD 21401

PEELINGS II
2260 Oleander Street
Las Cruces, NM 88004

Personal Computing
Benwill Publishing Corp
1050 Commonwealth Avenue
Boston, MA 02215

PET: Cursor
Cursor
Goleta, CA 93017

PIPELINE
Conduit
Box 388
Iowa City, IA 52244

POPULAR COMPUTING
70 Main Street
Peterburough, NH 03458

PROG/80
Softside Publications
6 South Street
Milford, NH 03055

Recreational Computing
People's Computer Company
Box E
Menlo Park, CA 94025

Robert Purser's Magazine
Robert Purser
PO Box 466
El Dorado, CA 95623

School Microware Directory
Dresden Associates
Box 246
Dresden, MA 04342

School Microware Review
Dresden Associates
Box 246
Dresden, MA 04342

SCIENTIFIC AMERICAN
Box 5959
New York, NY 10017

SIGCUE Bulletin
Association for Computing Machinery
Special Interest Group on Computer Uses in Education
1133 Avenue of the Americas
New York, NY 10036

SOFTALK
11021 Magnolia Boulevard
North Hollywood, CA 91601

SOFTSIDE: APPLE or SOFTSIDE: S-80 or SOFTSIDE: ATARI
Softside Publications
6 South Street
Milford, NH 03055

80 SOFTWARE CRITIQUE
80 Software Critique
PO Box 134
Waukegan, IL 60085

TALMIS NEWSLETTER
115 North Oak Park Avenue
Oak Park, IL 60301

TECHNOLOGY ILLUSTRATED
Box 2804
Boulder, CO 80321

T.H.E. JOURNAL
Box 992
Acton, MD 20172

T-PAL
The Mail Mart
San Francisco, CA 94101

TRS-80 Monthly Newsletter
Computronics, Inc.
Box 149
New York, NY 10956

The TRS-80 Notebook
RR #3
Nazareth, PA 18064

80-US Journal
PO Box 7112
Tacoma, WA 98407

VocEd
Journal of the American Vocational Association
American Vocational Association
2020 N 14th Street
Arlington, VA 22201

WASHINGTON APPLE PI
Box 34511
Bethesda, MD 20817

The first priority is to teach all students about the technological revolution of which computers are a part...the urgent need is for students to learn about the social impact technology has made and will make on their lives.

--Dr. Ernest L. Boyer
President of the Carnegie Foundation for the Advancement of Teaching

General Books

An Apple for the Teacher, George Culp and Herbert Nickles, Brooks/Cole Publishing Company: Monterey, CA, 1983.

Basic and the Personal Computer, Thomas A. Dwyer and Margot Critchfield. Addison-Wesley: Reading, MA, 1978.

Computer Awareness, Merle Wood. South-Western Publishing Company: West Chicago, IL, 1982.

Computers in the Classroom, H. Kepner, Jr. National Education Association: Washington, D.C., 1982.

Foundations of Computer Technology, Joseph Giarratano. Bobbs-Merrill Educational Publishing: Indianapolis, IN, 1983.

Help With Computer Literacy, June Atkinson. Houghton Mifflin: Boston, MA, 1984.

Layman's Guide to the Use of Computers in Education: Association for Educational Data Systems, Washingon, D.C., 1982.

Microcomputers and the 3R's: A Guide for Teacher, Christine Doeer. Hayden Book Company, Inc.: Rochelle Park, NJ, 1979.

Peanut Butter and Jelly Guide to Computers, Jerry Willis, Dilithium Press: Forest Grove, OR, 1978.

No machine, however adroitly designed and cleverly programmed, can take the place of a teacher's professional and personal intuition and knowledge about the children in his or her classroom.

--Mima Spencer and Linda Baskin

Resource Centers & Research Projects

American Industrial Arts Association/Purdue
Technology Education Software Bank
c/o Marvin I. Sarapin
Purdue University
Department of Industrial Technology
West Lafayette, IN 47907
(Public Domain Software: Utilities, Technical Applications, Educational, Business, or General Interest Programs)

Apple Swap
607 Sycamore
Starkville, MS 39759
(Compilation of educational and utility programs by teachers)

Association for the Development of Computer-based Instructional Systems (ADCIS)
Computer Center
Western Washington University
Bellingham, WA 98225
(Computer-based Instruction Resources & Newsletter)

California Library Media Consortium Reviews
San Mateo County Office of Education
333 Main Street
Redwood City, CA 94063
(Software Reviews)

Courseware Report Card--Elementary and Secondary Editions
Educational Insights
150 W Carob Street
Compton, CA 90220
(Software Review)

Curriculum Publications Clearinghouse
Western Illinois University
Horrabin Hall 46
Macomb, IL 61455
(Microcomputer Applications in Vocational Education)

DISC Project, IICD Oakland Schools
2100 Pontiac Lake Road
Pontiac, MI 48054
(Recommended Programs)

Educator's Hot Line
350 Union Station
Kansas City, MO 64108
800-255-5119
(Educator's Handbook & Software Directory)

EPIE Institute
PO Box 620
Stoney Brook, NY 11790
(Educational Products Information Exchange)

Illinois State Board of Education
Data Systems Section
100 N 18th Street
Springfield, IL 62777

International Council for Computers in Education (ICCE)
Department of Computer and Information Science
University of Oregon
Eugene, OR 97403
(Publications on instructional use of computers)

Journal of Courseware Review
Apple Computer
20525 Marianne Drive
Cupertino, CA 95014
(Software Reviews)

Kansas Career
Kansas State University
Manhattan, KS 66506
(Software)

Microcomputer Software and Information for Teachers
Northwest Regional Educational Laboratory
500 Lindsay Building
300 SW 6th Avenue
Portland, OR 97204
(Clearinghouse for K-12 Software Reviews & Newsletter)

MicroSIFT, NWREL
300 SW 6th Avenue
Portland, OR 97204
(Software Reviews)

Minnesota Education Computing Consortium
2520 Broadway Drive
St. Paul MN 55113
(Vocational Software, Newsletters & Documentation)

National Audio-Visual Association (NAVA)
3150 Spring Street
Fairfax, VA 22031
(Equipment Directory & Publications)

The National Center for Research in Vocational Education
The Ohio State University
1960 Kenny Road
Columbus, OH 43210
(An Administrator's Guide to Microcomputer Resources &
Microcomputers in Vocational Education: A Decision Guide)

Northwest Council for Computer Education
Computer Center
Eastern Oregon State College
LaGrande, OR 97850
(Workshops & Meetings for NW Educators)

Oregon Education Computer Consortium
700 Pringle Parkway SE
Salem, OR 97310
(Software & Guides)

Oregon State University Clearinghouse for
Computer Applications in Vocational Education
Batcheller Hall 100
Oregon State University
Corvallis, OR 97331
(Microcomputer Programs for Vocational Subjects)

Software Reports
Allenbach Industries
2101 Las Palmas
Carlsbad, CA 92008
(Software Reviews)

The Use of Computers in Vocational Instruction (Series)
American Vocational Association
2020 N 14th Street
Arlington, VA 22201

General Interest

Academic Software
22 E Quakenbush Avenue
Durmont, ND Ø7628
(Software)

Addison-Wesley Publishing Co.
Business & Professional Division
Reading, MA Ø1867
(Software)

American Micro Media
PO Box 3Ø6
Red Hook, NY 12571
(Software)

Apple Computer Inc.
2Ø525 Marianne Drive
Cupertino, CA 95Ø14
(Software & Hardware)

Applied Microsystems
PO Box 832
Roswell, GA 3ØØ77
(Software)

Applied Software Technology
14125 Capli Drive
Los Gatos, CA 95Ø3Ø
(Software)

Aquarius Software
PO Box 128
Indian Rocks Beach, FL 33535
(Software)

Aurora Systems
2Ø4Ø E Washington Avenue
Madison, WI 537Ø4
(Software)

Avante Garde Creations
PO Box 3Ø161
Eugene, OR 974Ø3
(Software)

B&B Software
PO Box 2090
Ann Arbor, MI 48106
(Software)

Bits & Bytes
Fenner Block
33 Church Street
Fredonia, NY 14063
(Software)

Brain Box
601 W 26th Street
New York, NY 10001
(Software)

Brookstone Associates
59 Gold Star Road
Cambridge, MA 02140
(Software)

Career Aids, Inc.
8950 Lierline Avenue, Dept. EC9
Chadsworth, CA 91311
(Software)

Charles Mann & Associates
55722 Santa Fe Trail
Yucca Valley, CA 92284
(Programs: Administrative, Budgeting, Grading, Scheduling, and Word Processing)

Compumax
PO Box 1139
Palo Alto, CA 94301
(Lesson Writing System)

Computer Courseware Service
EMC Publishing
Changing Times Ed. Services
297 York Avenue
St. Paul, MN 55101
(Software)

Creative Computing
PO Box 789-M
Morristown, NJ 07960
(Software)

Curriculum Project Review
Pitman Learning, Inc.
PO Box 2688
Clinton, IA 52735

Educational Dimensions Group
Box 126
Stamford, CT 06904
(Computer Literacy Filmstrip/Cassette)

Educational Services Management Corp.
PO Box 12599
Research Triangle Park, NC 27709
(Programs: Attendance, Reporting, Scheduling, Test Scoring, and Curriculum Mangement)

Educational Software Midwest
414 Rosemere Lane
Maquoketa, IA 52060
(CAI & CMI authoring system)

Eye Gate Media, Inc.
146-01 Archer Ave.
Jamaica, NY 11435
(Career Education & Consumer Education)

J. L. Hammett Company, Inc.
Hammett PLlace
PO Box 545
Braintree, MA 02184
(Computer Literacy Programs)

Hartley Courseware, Inc.
PO Box 431
Dimondale, MI 48821
(Software: Wordsearch)

Intellectual Software
798 North Avenue
Bridgeport, CT 06606
(Software)

J & S Software
140 Reid Avenue
Port Washington, NY 10050
(Apple Grade Book Program)

K-12 Micro Media
PO Box 17, Dept. G
Valley Cottage, NY 10989
(Software)

L & S Communications
1589 Fraser Drive
Sunnyvale, CA 940887
(Software: Crossword Puzzle Magic)

The Learning Seed
21250 N Andover
Kildeer, IL 60047
(Software)

The Micro Center
Dept. H82
PO Box 6
Pleasantville, NY 10570
(Software)

Microcomputers in Education
4148 Winnetak Avenue, North
Minneapolis, MN 55427
(Software)

Scholastic Incorporated
PO Box 1068
Jefferson City, MO 65102
(Software: Bank Street Writer)

Spectrum Software
142 Carlow
PO Box 2084
Sunnyvale, CA 94087
(Program: Color Calendar)

Sunburst Communications
39 Washington Avenue
Pleasantville, NY 07960
(Micro Survival Mathematics)

Teaching Aids, Inc.
PO Box 1798
Costa Mesa, Ca 92636-0798
(Software)

An equally urgent problem faced by educators is developing curriculum which integrates the computer and takes the fullest advantage of its potential as a teaching tool.

--Paul Horowitz, Bolt Beranek and Newman, Inc. (designers of the LOGO language) Speaking to the House Subcommittee of Science, Research and Technology

Special Needs Information

Apple Computer Inc.
Educational Division
20525 Marianne Drive
Cupertino, CA 95014
(A Resource Guide: Personal Computers for the Physically Disabled)

Bertamax, Inc.
Suite 500
101 Nickerson Street
Seattle, WA 98109
(Programs for the handicapped)

Brookline Books
460 Broadway
Cambridge, MA 02138
(Microcomputers in Special Education: An Introduction to Instructional Applications)

Closing the Gap
PO Box 68
Minneapolis, MN 56044
(Computer Technology to Help the Handicapped)

Committee on Personal Computers and the Handicapped
COPH-2
2030 W Irving Park Road
Chicago, IL 60618

Coordinator, Computer-Assisted Instruction
California School for the Deaf
2601 Warring Street
Berkeley, CA 94704

Gifted and Talented Programs
1643 LaSalle Street
Racine, WI 53404

J. L. Hammett Company, Inc.
Hammett Place
PO Box 545
Braintree, MA 02184
(Special Education)

Interpretive Education, Inc.
Suite 250
157 S Kalamazoo Mall
Kalamazoo, MI 49007
(Secondary Special Education)

K-12 Micromedia
PO Box 17
Valley Cottage, NY 10989
(Computer Literacy Programs)

Reston Publishing Company
11480 Sunset Hill Road
Reston, VA 22090
(Microcomputer Resource Book for Special Education)

Special Education Technical Online Resources
Exceptional Child Center
Utah State University
Logan, UT 84322
(Software Reviews)

Vocational Studies Center
University of Wisconsin-Madison
964 Educational Services Building
1025 W Johnson Street
Madison, WI 53706
(Effective Microcomputer Assisted Instruction for the Vocational Education of Special Needs Students)

Parents and teachers of exceptional children now realize that micro use is not limited to exotic applications for the severely handicapped, mentally retarded, as well as gifted students--and are looking for ways to apply this technology to their children's education.

--Margie Mason, Project Coordinator, Project MASS (Micro-computer Assistance for Special Students), Charleston, IL

Grants &Funding

Apple Education Foundation, Inc.
20605 Laaneo Drive
Cupertino, CA 95014
(Apple Computer Donations & Projects)

National Audio-Visual Association (NAVA)
3150 Spring Street
Fairfax, VA 22031
(Guide to Federal Funds)

Agriculture Education

Administrative Services
University of Florida
IFAS, Building 664
Gainesville, FL 32611
(General Information & Inventory of Agricultural Computer Programs)

Agnet
Department of Agricultural Economics
Kansas State University
Manhattan, KS 66506

Agriculture and Rural Development Programs
Attn: Extension Economist
Oklahoma State University
Room 513 Ag Hall
Stillwater, OK 74078
(General Application Programs)

Agricultural Computer Software, Inc.
PO Box 706
Muscatine, IA 52761
(Software)

Agricultural Computing Sourcebook
Doane-Western, Inc.
8900 Manchester Road
St. Louis, MO 63144
(Resources)

Agricultural Management & Economic Consulting
315 Haggerty Lane
Bozeman, MT 59715
(Software)

Agri-Computer Systems
113 N 9th Street
Frederick, OK 73542
(Software)

Agri Ware Inc.
PO Box 1715
Hereford, TX 79045
(Software)

Agpros Source Books
Agpros Micro Systems
PO Box 64539
Lubbock, TX 79464
(Resources)

Broussald Feeds, Inc.
110 E Third Street
PO Box 2577
Lafayette, LA 70501
(Software)

Curriculum Publications Clearinghouse
Western Illinois University
46 Horrabin Hall
Macomb, IL 61455
(General Information & Programs)

Farm Computer News
Successful Farming Magazine
Locust at 17th
Des Moines, IA 50336
(General Information)

Hobar Publications
1234 Tiller Lane
St. Paul, MN 55112
(Software)

Instructional Materials Services
Department of Ag. and Ext. Education
The Pennsylvania State University
13 Armsby Building
University Park, PA 16802
(General Information & Programs)

Microcomputer Resource Guide for Agriculture
Agricultural Education Program
Department of Applied and Behavioral Sciences
University of California
Davis, CA 95616
(Resources)

Microcomputer Software Exchange
Division of Vocational Education
Oakland Schools
2100 Pontiac Lake Road
Pontiac, MI 48054
(General Information & Programs)

Minn-Aids
Extension Farm Management
University of Minnesota
249 C.O.B.
St. Paul, MN 55108
(General Information)

North Central Computer Institute
667 WARF Office Building
610 Walnut Street
Madison, WI 53705
(General Resources)

Northeast Computer Institute
Agriculture Administration Bldg.
Room 325
University Park, PA 16802
(Agriculture Resources and Programs)

Oklahoma State University
Dept. of Agricultural Economics
Extension Farm Management
Stillwater, OK 74078
(Software)

Power Up
PO Box 306
125 Main Street
Half Moon Bay, CA 94019
(Software: Management and Garden Planting)

Wait Cattle Co.
133 Carolyn Lane
Nicholasville, KY 40356
(Software)

Vocational Agricultural Services
University of Illinois
436 Mumford Hall
Urbana, IL 61801
(General Information & Resources)

Vocational Education Productions
California Polytechnic State University
San Luis Obispo, CA 93407
(Agriculture Resources)

Business Education

Blackhawk Technical Institute
6004 Prairie Road
PO Box 5009
Janesville, WI 53547

BPI Systems, Inc.
1600 W 38th Street #444
Austin, TX 78731
(Programs: Administrative Packages & Accounting)

Charles Mann and Associates
7594 San Remo Trail
Yucca Valley, CA 92284
(Retail Management)

Computer Distributers
PO Box 9194
Austin, TX 78766
(Software: Inventory)

Computer House Division
1407 Clinton Road
Jackson, MI 44202
(Distributive Education Software)

Creative Computing
Software
39 E Hanover Avenue
Morris Plains, NJ 07950
(Lemonade Stand)

Dynacomp, Inc.
1427 Monroe Avenue
Rochester, NY 14618
(General)

Hayden Book Company
50 Essex Street
Rochelle Park, NJ 07662
(Software: Management Decisions)

IBM Systems Products Division
PO Box 1328
Boca Raton, FL 33432
(Typing Tutor)

Micro Architect, Inc.
96 Dothan St.
Arlington, MA Ø2174
(Data-base Management and Word Processing Programs)

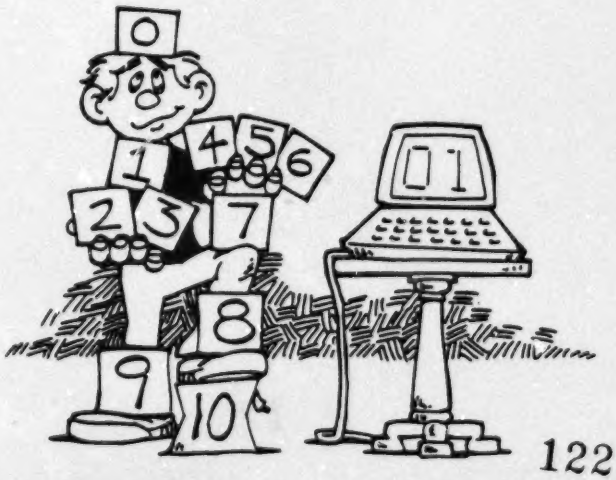
Monroe Education Center
c/o Monroe Systems for Business
The American Road
Morris Plains, NJ Ø795Ø
(Programs: Business Education)

Power Up
PO Box 306
125 Main Street
Half Moon Bay, CA 94Ø19
(Software: Spreadsheet, Calculator, Typewriter,
and Investment Programs)

Rockroy
7721 E Gray Road
Suite 1Ø3
Scottsdale, AZ 85260
(Software: Conglomerates Collide)

Softaide
6 South Street
Milford, NH Ø3Ø55
(Software: Micro Millionaire)

Strategic Simulations
465 Fairchild Drive
Suite 1Ø8
Mountain View, CA 94Ø43
(Software: Cartels & Cutthroats)



Home Economics Education

Aquarius Publishers
PO Box 68
Indian Rock, FL 33535
(Software: Consumerism & Understanding Labels)

Avante Garde Creations
PO Box 30161
Eugene, OR 97403
(Software: Life Dynamics/Relationships)

C & H Video
110 West Caracas Avenue
Hershey, PA 17033
(Program: The Menu)

Computer Courseware Services
Division of EMC Publishing
Changing Times Education Service
300 York Avenue
St. Paul, MN 55101
(Programs: Budgeting and Budgeting Simulation)

Dietary Data Analysis
PO Box 26
Hamburg, NJ 07419
(Computer Software for Nutrition)

E.M. Enterprises
3 Hickory Road
Denville, NJ 07834
(The Home Economist's Computer Newsletter)

Family Computing
PO Box 2612
Boulder, CO 80321
(Magazine)

FORECAST for Home Economics
Office of Publication
Box 2700
351 Garver Road
Monroe, OH 45050-2700

Home Economics Education Association
1201 Sixteenth Street NW
Washington, DC 20036
(Computer in the Home Economics Classroom)

Home Economics School Service
10000 Culver Blvd., Dept. 84
PO Box 802
Culver, CA 90230
(Software)

Interpretive Education, Inc
Suite 250
157 S Kalamazoo Mall
Kalamazoo, MI 49007
(Money Management & Home Safety Programs)

Journal of Nutrition Education
1736 Franklin Street
Suite 900
Oakland, CA 94612
(Computers in Nutrition Education)

Lawrence Hall of Science
Math/Computer Education Project
University of California
Berkeley, CA 94720
(Program: What's In Your Lunch?)

The Learning Seed Company
21250 N Andover
Kildeer, IL 60047
(Programs: Snack Master, Fast Food Micro-Guide, and
What Did You Eat Yesterday?)

MCE, Incorporated
Interpretive Education
2306 Winters Drive
Kalamazoo, MI 49002
(Programs: Home Safe Home & Managing Your Time)

Nasco Nutrition Teaching Aids
1524 Princeton Avenue
Modesto, CA 95352
(Software)

Nutrition Information and Resource Center
Benedict House
The Pennsylvania State University
University Park, PA 16802
(Program: EATS)

Orange Juice Software Systems
222 S Washington Avenue
New Richmond, WI 54017
(Program: Know Your Pattern)

Oregon Dairy Council
10505 SW Barbur Blvd.
Portland, OR 97219
(Program: Grab A Byte)

Oregon Education Computer Consortium
700 Pringle Parkway SE
Salem, OR 97310
(Programs: Nutrition)

Norma Peters
912 Vermont Street
Waterloo, IA 50702
(Programs: Energy Savings with Window Treatments & Drapery Yardage/Pleating)

N-Squared Computing
Analytic Software
5318 Forest Ridge Road
Silverton, OR 97381
(Nutrition)

The Pillsbury Company
3286 Pillsbury Center
Minneapolis, MN 55402
(Program: Eat Smart)

Power Up
PO Box 306
125 Main Street
Half Moon Bay, CA 94019
(Software: Smart Shopper, Cookbook)

Strictly Software
4321 N 39th Street
Phoenix, AZ 85018
(Software for Home & Home Economics)

Teaching Aids, Incorporated
PO Box 1798
Costa Mesa, CA 92626-0798
(Software: Personal Energy Inventory, Electric Bill, and Home Energy Savings)

Virtual Combinatics
PO Box 755
Rockport, MA 01966
(Program: Smart Shopper)

Clo Wiltse
Volborg, MT 59351
(Programs: The Calorie Study, The Cost Study, Recipe Search, and The Two-Income Lifestyle Study)

Industrial Education

American Industrial Arts Association/Purdue
Technology Education Software Bank
c/o Marvin I. Sarapin
Purdue University
Department of Industrial Technology
West Lafayette, IN 47907
(Public Domain Software: Utilities, Technical Applications, Educational, Business, or General Interest Programs)

Apple Swap Programs
607 Sycamore
Starkville, MS 39759
(Two Industrial Arts Disks)

California Micro Products
795 West Imperial Highway
Brea, CA 92621

Computer House Division
1407 Clinton Road
Jackson, MI 44202

Convergent Systems, Inc.
245 E 6th Street
St. Paul, MN 55101

Feedback
620 Springfield Avenue
Berkeley Heights, NJ 07922

Fundamentals of Microcomputers for Industrial Arts Instructors
American Council of Industrial Arts Supervisors
American Industrial Arts Association
1914 Association Drive
Reston, VA 22091

Hobar Publications
1234 Tiller Lane
St. Paul, MN 55112
(Industrial Arts Software)

Iowa State Department of Public Instruction
Information & Publication Division
Grimes State Office Building
Des Moines, IA 50319
(Iowa Handbook of Basic Computer Programs
for Industrial Arts & 33 IA Programs)

Lennox Education Products
PO Box 400450
Dallas, TX 75240

Macrotronics, Inc.
1125 N Golden State Blvd.
Turlock, CA 95380

MicroLearning Ware
PO Box 2134
North Mankato, MN 56001

Micro Power and Light
12820 Hillcrest Road #224
Dallas, TX 75230
(Programs: Skills & Tools)

Minnesota Curriculum Service Center
3554 White Bear Avenue
White Bear Lake, MN 55110
(General Apple Diskette of Industrial Arts)

Minnesota Education Computer Consortium (MECC)
2520 Broadway Drive
St. Paul, MN 55113
(IA and T&I Programs, Teacher Utilities)

Oregon State University Clearinghouse for
Computer Applications in Vocational Education
Batcheller Hall 100
Oregon State University
Corvallis, OR 97331
(Industrial Arts and T&I Programs for Apple
Computers)

Powersoft
PO Box 157
Pitman, NJ 08701
(Automotive Diagnosis & Graphing)

Radio Shack Education Division
400 Tandy Atrium
Fort Worth, TX 76102
(History of Technology Program)

Realth Software
2045 Manhattan Avenue
Hermosa Beach, CA 90254
(Construction)

Western Illinois University
Microcomputer Applications in Vocational Education
Macomb, IL 61455
(T&I Information)

By making computers a familiar fixture in the classroom, educators may help today's students avoid the technophobia that often plagues their parents. And by integrating the computer into the learning process, they can take advantage of its capabilities as an instructional tool.

--Paul Bonner, Senior Editor
Personal Computing